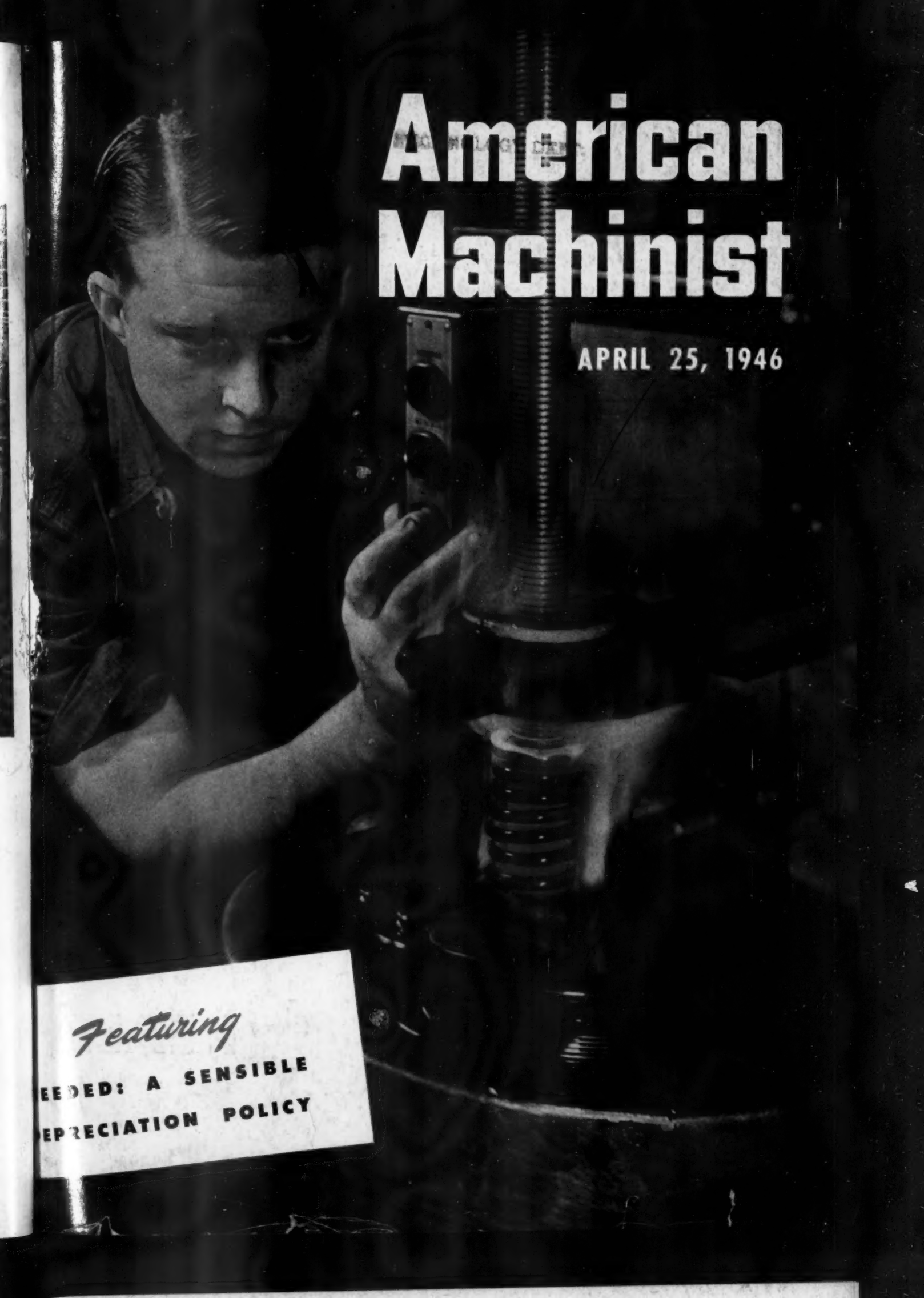

American Machinist

APRIL 25, 1946

Featuring

EEDED: A SENSIBLE
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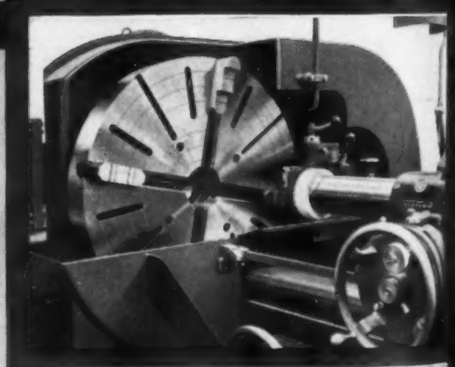
Heald's Gap-base Internal has Plenty of EXTRA CAPACITY!

If it's *capacity* you're looking for, the Heald No. 172 Gap Internal has it! Capacity to swing work up to 36 inches diameter—with holes up to 14" diameter.

If it's *versatility* you want, the No. 172 has that, too—with its low work centers and its adjustable gap base construction that permits gap adjustment to specifically suit length of work.

Designed especially for handling the "big stuff," this particular Internal has one thing in common with all Heald machines—the ability to pay for itself many times over in improved precision and lower production costs.

It is engineering like this that can easily mean the difference between profit and loss on any production line, especially when so many other factors may be beyond control. Whether your operation involves high-speed mass production employing thousands of workers, or whether you have a small shop employing only a handful, Heald engineers will be glad to study your production problems with an eye to cutting costs. Write: THE HEALD MACHINE COMPANY, WORCESTER 6, MASS.



Heald No. 172 Gap Internal was furnished for grinding blanking dies and miscellaneous tool room work. Holding fixture shown in 36" capacity, 4-jaw chuck.

HEALD

means finer precision . . . lower costs

INTERNAL AND SURFACE GRINDING MACHINES · BORE-MATIC PRECISION FINISHING MACHINES

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MAGAZINE OF METALWORKING PRODUCTION

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Chips and QUIPS

Threaded Heat-treatment . . . Compound-rest and crossfeed screws (½ to 1¼ in. in dia.) on all *Monarch* lathes are hardened, then ground for accuracy and strength. Threads are rough-chased on a lathe, then the screw, held in a self-centering chuck, is rotated and fed by a variable-speed motor downward through the 375,000-cycle ac. induction-heating coil into an oil quench, as pictured in our cover Kodachrome. Hardness of screws ranges from 48 to 52 Rockwell C, with minor distortion. Final grinding is to a lead error less than 0.0003 in. in any 4 in., or 0.0009 in. per ft. Monarch engineers developed both methods and equipment. Oil overflowing from the 10-in. dia. vertical quenching standpipe passes through a heat exchanger for cooling, then is pumped into the standpipe base.

Formula for A Sermon . . . A colored preacher once "formula-ized" his sermon by explaining: "First Ah tells 'em whut Ah gonna tell 'em, den Ah tells 'em, and den Ah tells 'em whut Ah tole 'em." Good formula—if you have an hour to spend on a subject. We prefer to tell 'em, then quit. That's why we like Dr. Hausner's fast-moving report on processes in powder metallurgy, Mr. Borden's explanation of his tool-control system, the explanation of Kellett's grievance procedure, and the other articles in the pages that follow. No furbelows and fancy words—just plain facts.

Law O.K., Interpretation Faulty . . . Our laws permit fast depreciation of machine tools, but minor Treasury officials who interpret them slow up the operation to increase tax reurns. In a special report in this issue, Burnham Finney explains the situation, suggests procedures.

Playing Hard-to-Get . . . Lazy or inept authors and illustrators have long fostered the popular belief that knowledge must be gained by hard and unremitting burning of the midnight oil. Well, Brother, that's eyewash, as the armed services proved when they taught drug-store clerks to operate radar. We've proved to our own satisfaction, too, that extra midnight oil on the part of an author or an editor reduces the labor of thousands of readers in soaking up what he has to say. That takes more editors and better illustrators, but produces pages like our *Shop Shots*, *Practical Ideas*, and *Short Cuts*, among the most popular with readers issue after issue.

Production Pointers . . . Cutter control with carbides has been worked out to a fine point at Kearney & Trecker. Editorial pages of this issue open with an explanation of the methods and equipment . . . Steel rolls, whever they're used, can be a problem. S. C. Spalding, metallurgist at American Brass, summarizes his experience with it in a 5-page report. We believe it includes pointers for production men everywhere.

It's A Snap . . . Precision snap-acting switches have dozens of shop applications because of their compactness, speed of operation, dependability. Arthur J. Roche has rounded up more than a dozen, combines them in the fast-moving picture-and-caption story in our next.

Art Invades the Shop . . . For the May 9 issue, also, we're all going to be aesthetic in a practical way. There'll be a 12-page special report on "How to Use Color in the Shop," giving latest practice and proved principles. Included in the illustrations will be some in full color—making their first appearance inside *American Machinist* . . . In addition, Chester Ricker describes in just-released pictures how Chrysler used clay, wood and plaster mockups to speed development of its V-16 aircraft engine. A corps of artists and modelers saved their cost five times over.

PORTRAIT OF THE WEEK

The gentleman behind the boiler is Herman Schlarman, "Murphy" to friends, who uses his initial to save time. After graduation in 1928 from the G. E. Engrg. School, he went to Jones & Lamson, where he has been ever since, in the Thread Tool Div. He tooled the first tangent die-head, was a service man, a "floating representative," and for the last 7 or 8 years has been in charge of J & L thread-tool service and engineering in the Michigan area. Hence his later-to-be-a-book series on die-heads, No. 4 herewith.

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• • •

Write for descriptive literature . . . Send in prints of parts you wish to quench . . . Let us show you how this new Gleason Quenching Press will solve your quenching problems.

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Builders of BEVEL GEAR MACHINERY FOR OVER EIGHTY YEARS

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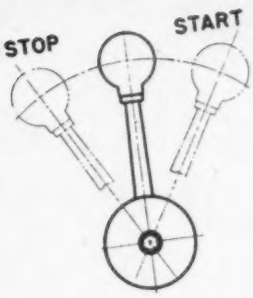
Left: The new CINCINNATI No. 4-48 Duplex Hydromatic. Sweet's Catalog File gives a brief description of the Plain and Duplex Hydromatic Millers.

The new CINCINNATI No. 5-60 Plain Hydromatic Milling Machine. Catalog M-1372 contains complete engineering specifications for the Plain and Duplex styles.

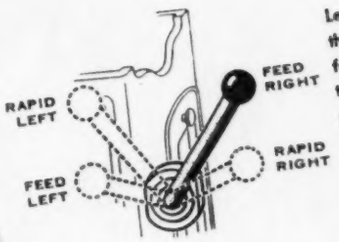
CINCINNATI

THE CINCINNATMI

MILLING MACHI



Spindle Drive Clutch Lever. This lever hydraulically engages and disengages the heavy multiple disc clutch, thereby reducing the physical effort of starting to almost zero, and assuring complete clutch engagement.

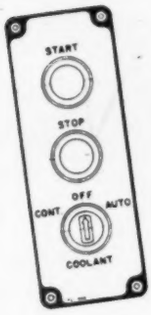


Lever for manually engaging travel of the table from right to left, and also for changing from feed to rapid traverse or vice versa. On machines equipped with one-direction feed, the upper right-hand position of this lever stops the table. For two-way cycle machines, the stop position becomes "Feed Right."

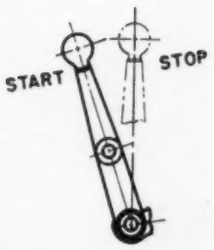
THE NEW CINCINNATI HYDROMATICS *are easier to operate!*

● In the new CINCINNATI Hydromatic Millers, hydraulics become the servant of the operator and relieve him of much manual labor. For example, hydraulic power engages and disengages the spindle drive clutch . . . starts and stops the table traverse . . . moves the table at rapid traverse and feed rates (including completely automatic cycles) . . . varies the table feed rate* . . . tarries the table for a predetermined period of time to clean up radius cuts.* Then there are other factors which contribute to ease of operation. Electrical push-buttons are built-in, centralized with the control levers. The coolant flow starts and stops automatically with the rotation of the cutter. And for convenience in setting up the machine, a single lever controls all forward and reverse movements of the table. Cross and vertical hand adjustments, respectively, of quill and spindle carrier, have micrometer dials. ¶These and many other features are incorporated in the new CINCINNATI Hydromatic Millers which are especially adaptable to operations requiring heavy cuts and rapid metal removal on all types of metal, using sintered carbide as well as high speed steel cutters. Complete engineering specifications will be sent on request.

*Available at slight extra cost.



Electrical Control Buttons. The middle button is the master stop. The coolant control button at the bottom has two operation positions, continuous flow and automatic (i.e.coolant flow automatically starts and stops with the spindle rotation).



Left: Lever for re-engaging the automatic table feed cycle after the fixtures have been reloaded. Also convenient for quickly stopping table movement at any time.

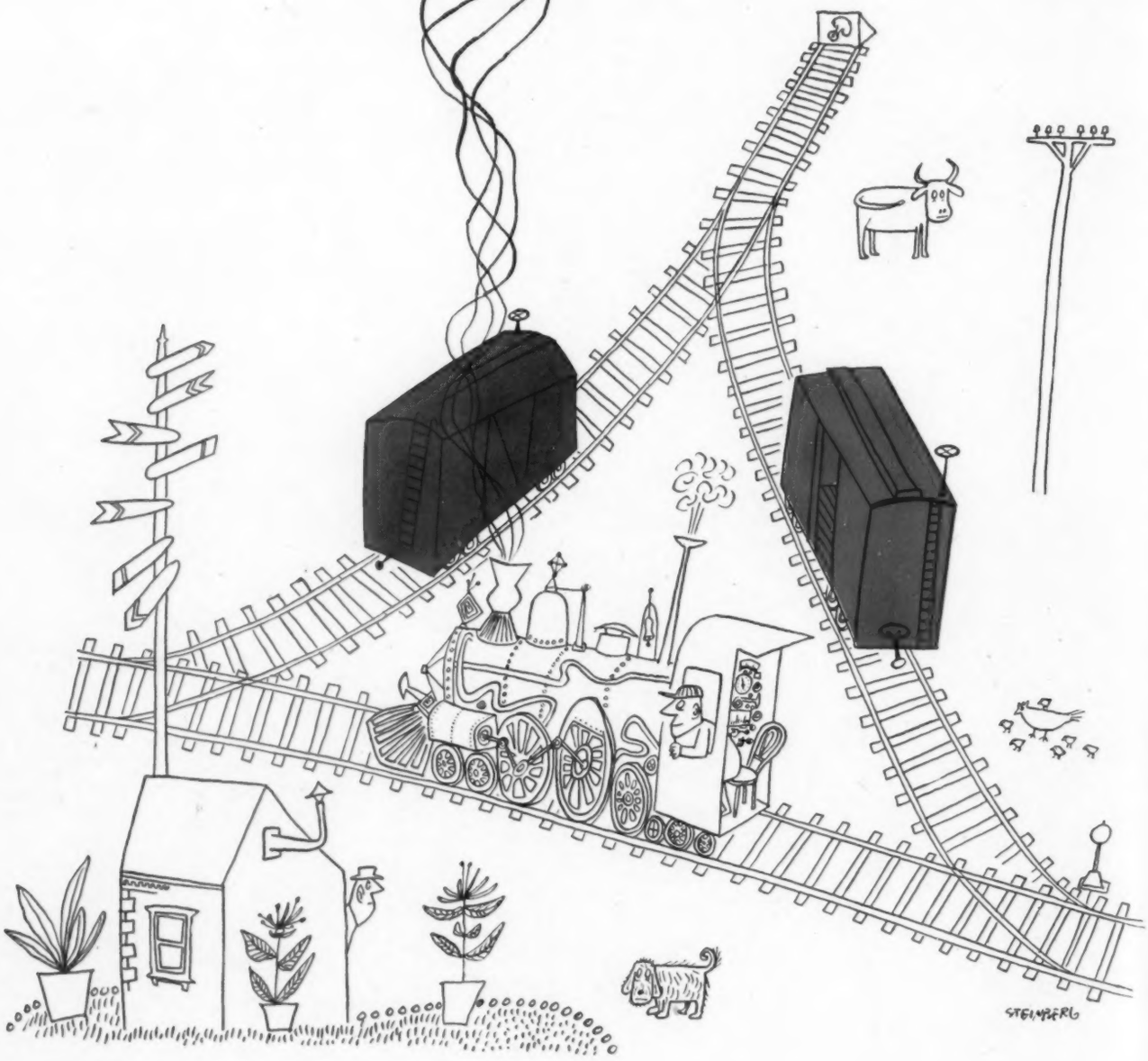
Table Feed Rate Control Lever. Any feed rate, between 0 and 30" or 0 and 40" per minute, depending upon the size of the machine, may be obtained by moving lever to the feed desired while the machine is running, with the table feed either engaged or disengaged. Feeds may be varied automatically to suit the cutting conditions.

ATMILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

NO.2:

THE GREAT



TRAIN PUZZLE!

The problem: Switch the positions of the two freight cars — and don't trap your engine on the spur.

Ready? Give her the throttle, Casey, old 99 is due back at the yards exactly three minutes from now.

There's a moral to this little puzzle: Even the simplest switch-over often calls for some sharp figuring by the man at the throttle.

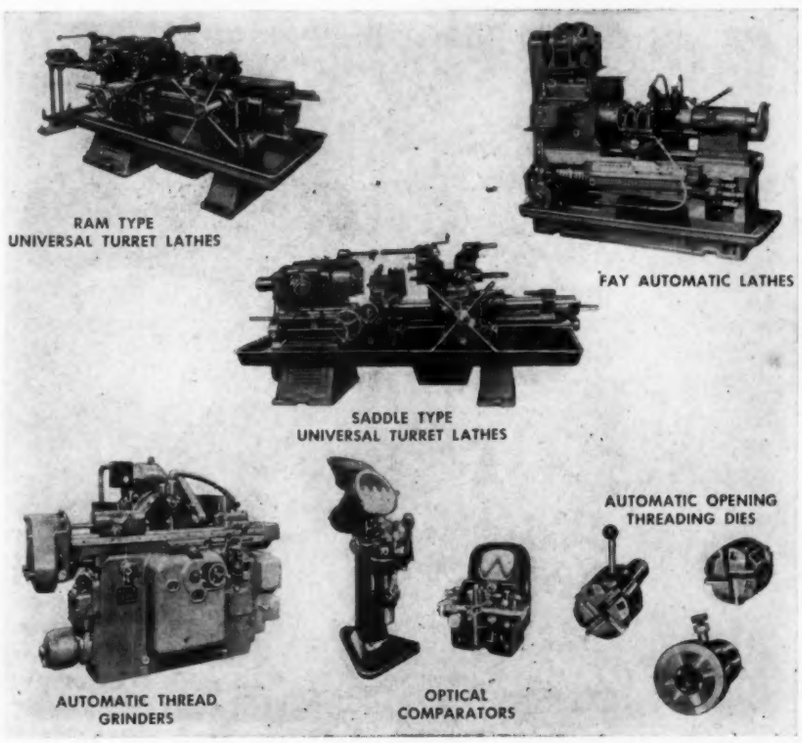
In the intense competition that now confronts you, sharp figuring on costs and equipment — and speed in the switch-overs — may make the difference between profit and loss, a market or a muddle.

For instance: In your plant, turning may account for 25 per cent or more of machining time. Probably this could be substantially reduced by the *efficient* use of carbide cutting tools which remove metal 200 to 500 per cent faster. There are cases in our files of savings of hundreds of dollars a month in the manufacture of a single part by the use of Jones & Lamson machines designed specifically for the most efficient use of these tools.

It will pay you to check now on the production efficiency of all metal turning equipment in your plant — and to replace it, if need be, with good War Surplus Machines or new machines.

In this we are prepared to help you. Simply telephone or write today, and a Jones & Lamson engineer will be glad to consult with you on any phase of your tooling or production problems.

Or send for our book, "Welcome to You and Your Problem," for a quick glance at the facilities of the oldest company of machine tool builders in America.



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Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.

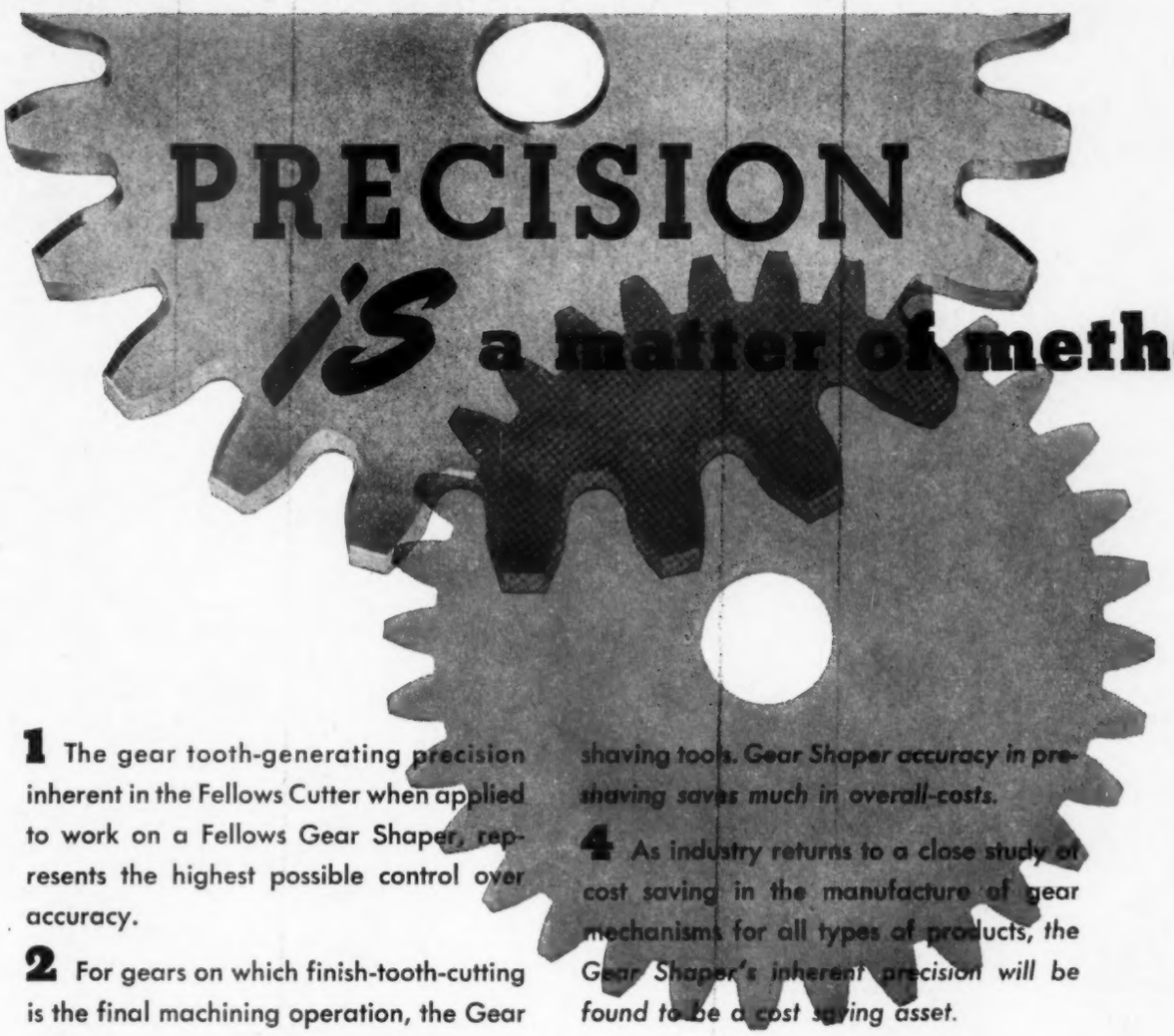
GEAR

Fellows 6A-type Gear Shaper for cutting external and internal spur and helical gears. A most versatile machine for cutting gears and kindred parts.

The Fellows Gear Shaper Line Includes:

- ★ 7-and 7A-types for spur and helical gears up to 7 inches pitch diameter.
- ★ 6A-type for work to 18 inches pitch diameter.
- ★ 6-type for spur and helical gears up to 35 inches pitch diameter.
- ★ 6-type Models Z and Y for large shank gears and large internal gears.
- ★ No. 30 Gear Shaper for cutting coarse-pitch external and internal spur gears.
- ★ No. 48 Gear Shaper for cutting internal spur and helical gears.
- ★ 100-Inch Gear Shaper for cutting external and internal spur gears.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR



PRECISION *is* a matter of method

1 The gear tooth-generating precision inherent in the Fellows Cutter when applied to work on a Fellows Gear Shaper, represents the highest possible control over accuracy.

2 For gears on which finish-tooth-cutting is the final machining operation, the Gear Shaper pays an extra dividend in maintaining a standard of accuracy which permits truly interchangeable assemblies. *Rejects are minimized.*

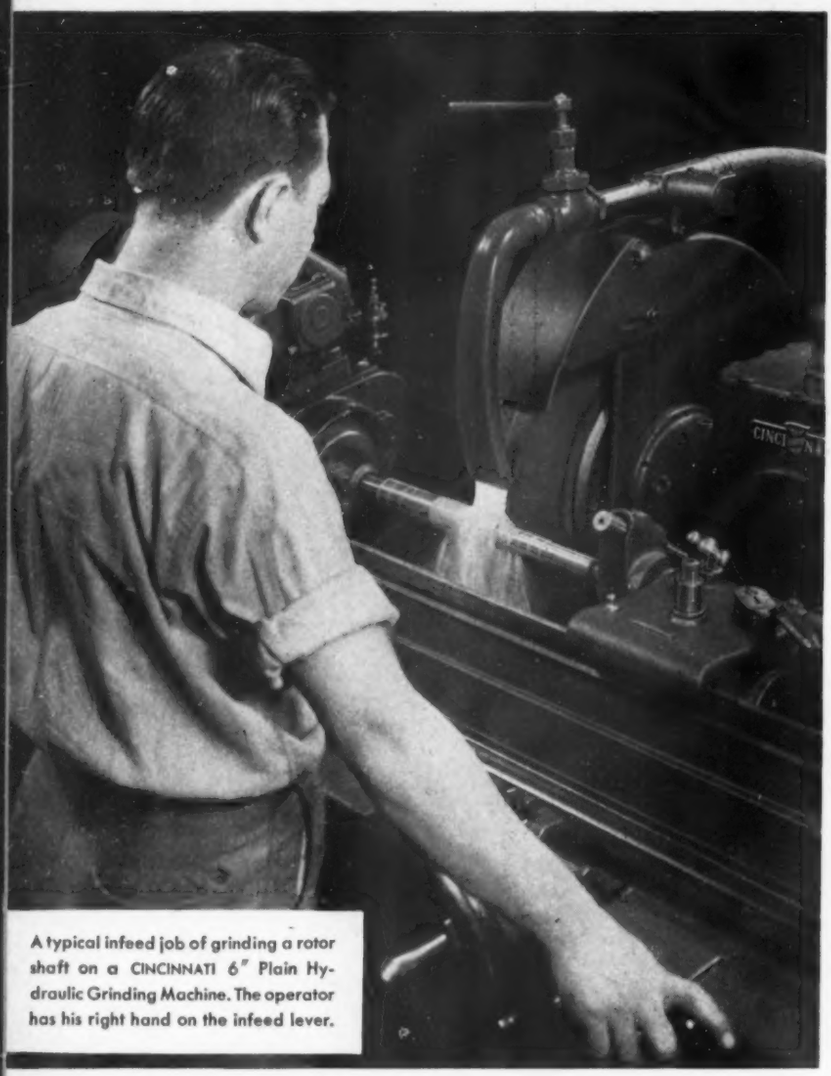
3 As a pre-shaving operation, finish cutting on the Gear Shaper holds to limits which increases the life of ultra-precise shaving tools. *Gear Shaper accuracy in pre-shaving saves much in overall-costs.*

4 As industry returns to a close study of cost saving in the manufacture of gear mechanisms for all types of products, *the Gear Shaper's inherent precision will be found to be a cost saving asset.*

For a complete outline of Fellows gear cutting equipment, we suggest that you ask for a copy of "The Fellows Method". Write: The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Bldg., Detroit, or 640 West Town Office Bldg., Chicago.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



A typical infeed job of grinding a rotor shaft on a CINCINNATI 6″ Plain Hydraulic Grinding Machine. The operator has his right hand on the infeed lever.

Above: Hand Servo Infeed Attachment—hydraulically operated. For manual control of plunge cut grinding. Includes rapid advance of wheel to work, and automatic starting and stopping of coolant flow and work rotation. Total wheelhead movement equals 1″, about .990″ of which is rapid traverse.

CINCINNATI FILMATIC No. 10″-L PLAIN HYDRAULIC GRINDING MACHINE

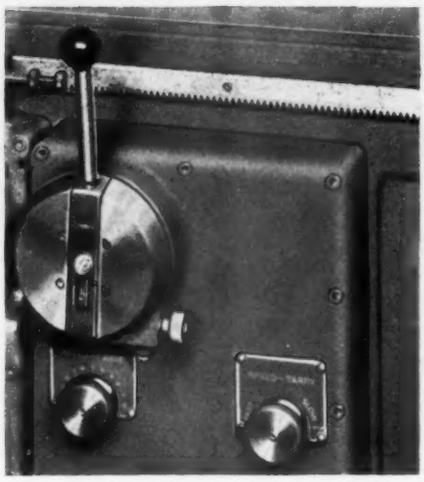
Infeed Grinding

Recipe for

MORE PRODUCTION AND HIGHER QUALITY OF INFEED GRINDING OPERATIONS

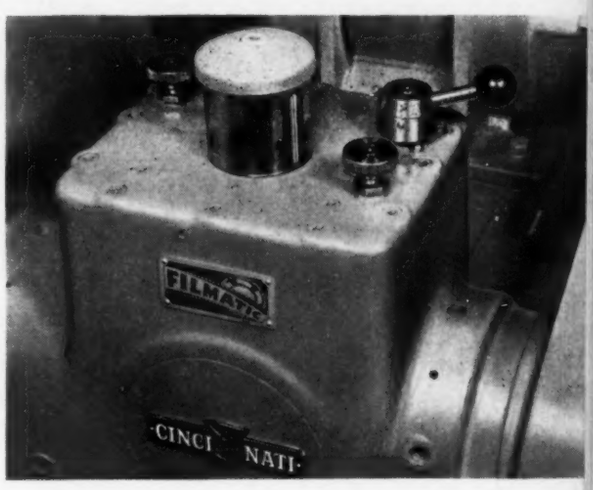
CINCINNATI

CENTER TYPE GRINDING MACHINE



Automatic Infeed Attachment—hydraulically operated. Complete cycle is automatic . . . rapid advance wheel to work, grind, tarry and return.

Spindle Reciprocating Attachment. Reciprocation of grinding wheel spindle is automatic, with standard stroke from 1/32" to 3/16". This is an unusually desirable feature for all infeed grinding operations.



Illustrating the use of the Hand Servo Infeed Attachment. This device offers manual control of hydraulic movement of the wheelhead for infeed grinding operations. Recommended for comparatively small quantities of infeed work.

With the Automatic Infeed Attachment, the operator simply moves the lever a slight amount, then the entire cycle proceeds automatically. While grinding continues, operator may prepare next work piece. This feature is especially desirable for infeed grinding of large quantities.

To a CINCINNATI FILMATIC Plain Hydraulic Grinder, add a grinding wheel spindle Reciprocating Attachment and a Hand Servo Infeed Attachment or an Automatic Infeed Attachment, and you have the recipe for production infeed grinding operations, finished and sized to extra high quality. ¶ The spindle Reciprocating Attachment automatically reciprocates the grinding wheel, eliminating wheel marks and raising quality of finish. It may be adjusted for a stroke of 1/32" to 3/16", and for fast or slow reciprocation. The Hand Servo Infeed Attachment rapidly advances the wheel to the work, and further movement of the lever advances the wheel at a grinding rate. After spark-out, the lever is returned and the wheelhead rapidly retracts one inch (more if desired), which allows plenty of space to safely load and unload the work. This is for small to average quantities of parts. The Automatic Infeed Attachment is more desirable for grinding large quantities. The operator merely starts the lever on its downward arc, then it automatically takes over to rapid advance, grind, tarry and return. It has a "run ahead" feature, too, for varying stock allowances. ¶ These features, available at slight extra cost, add infeed to the traverse grinding operations which you may assign to your CINCINNATI FILMATIC Plain Hydraulics. Catalog No. G-537 contains engineering specifications on the 6" and 10"-L machines. Catalog No. G-533 gives complete information on the 14"-L grinder, and G-490-1 for the 10" machine. Write today for your copies of these catalogs.

GRINDERS INCORPORATED

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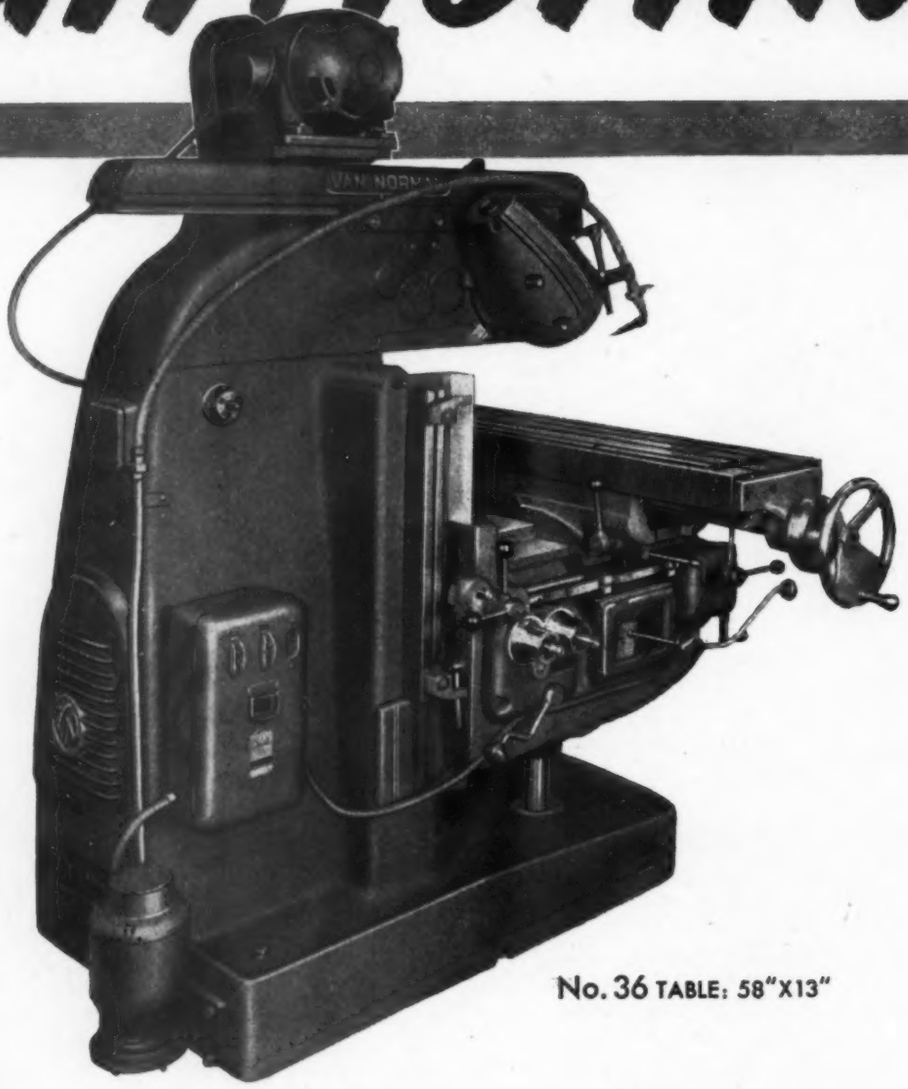
CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Van Norman



No. 36 TABLE: 58"X13"

Manufacturers in all types of industries step up milling production, minimize errors and cut costs per man- and machine-hour with Van Norman Ram Type Millers.

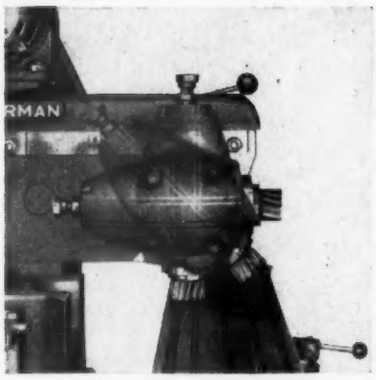
These versatile machines meet daily fluctuating milling requirements by enabling operators to perform horizontal, angular, or vertical milling, all with one machine. In addition, Van Norman Ram Type Millers cut idle operator and machine time as well as improve accuracy because most jobs can be carried through to completion in the original set-up. Other Van Norman advantages include front and rear *directional* control of all power feeds as well as six way rapid traverse, single lever feed selector, front and rear manual controls, heavy construction, massive cutterheads, anti-friction bearings and automatic lubrication.

See for yourself how these machines cut costs, improve accuracy and increase production in the toolroom, machine shop, experimental laboratory and pattern shop. Write: Van Norman Company, Springfield 7, Massachusetts.

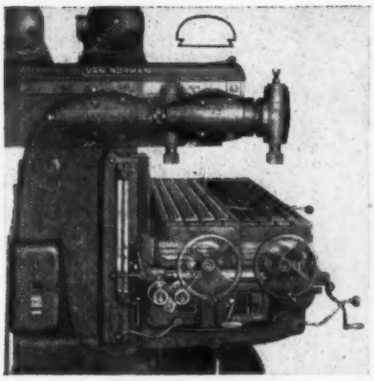
RAM TYPE MILLERS

Meet Job to Job Requirements

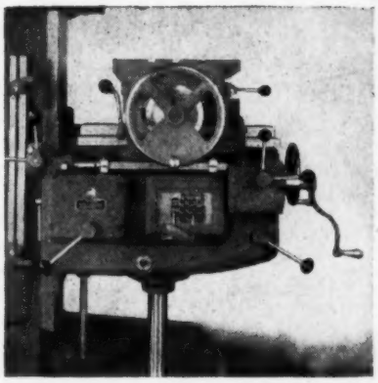
Cut Idle Machine Time Up to 50%



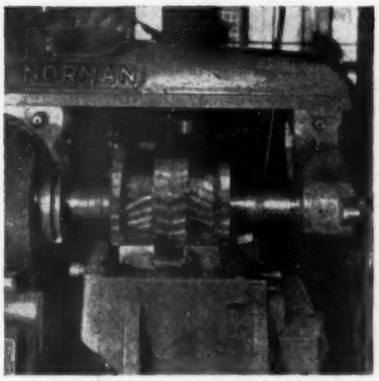
Adjustable cutterhead permits vertical, horizontal or angular milling . . . gives the work range of several single-purpose machines.



Adjustable cutterhead and movable ram in combination with the saddle crossfeed provide maximum versatility. (Subhead mounted on cutterhead.)

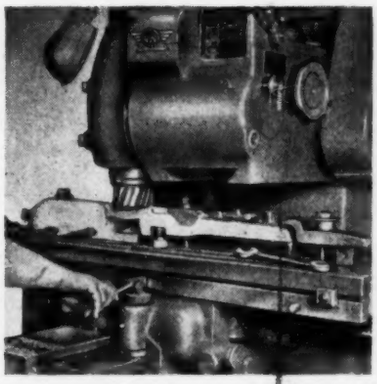


Front and rear control of hand and power feeds give complete visibility and control of operations from either location. Reduces worker fatigue.



Horizontal milling setup. The ram-type overarm with dovetail ways and outer support assures rigidity and accuracy.

With head locked in angular position the operator is taking an angular cut and operates the miller with rear controls.



The ram-type miller used with adjustable cutterhead in the vertical milling position . . . operator using front controls.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It Pays to Van Normanize"

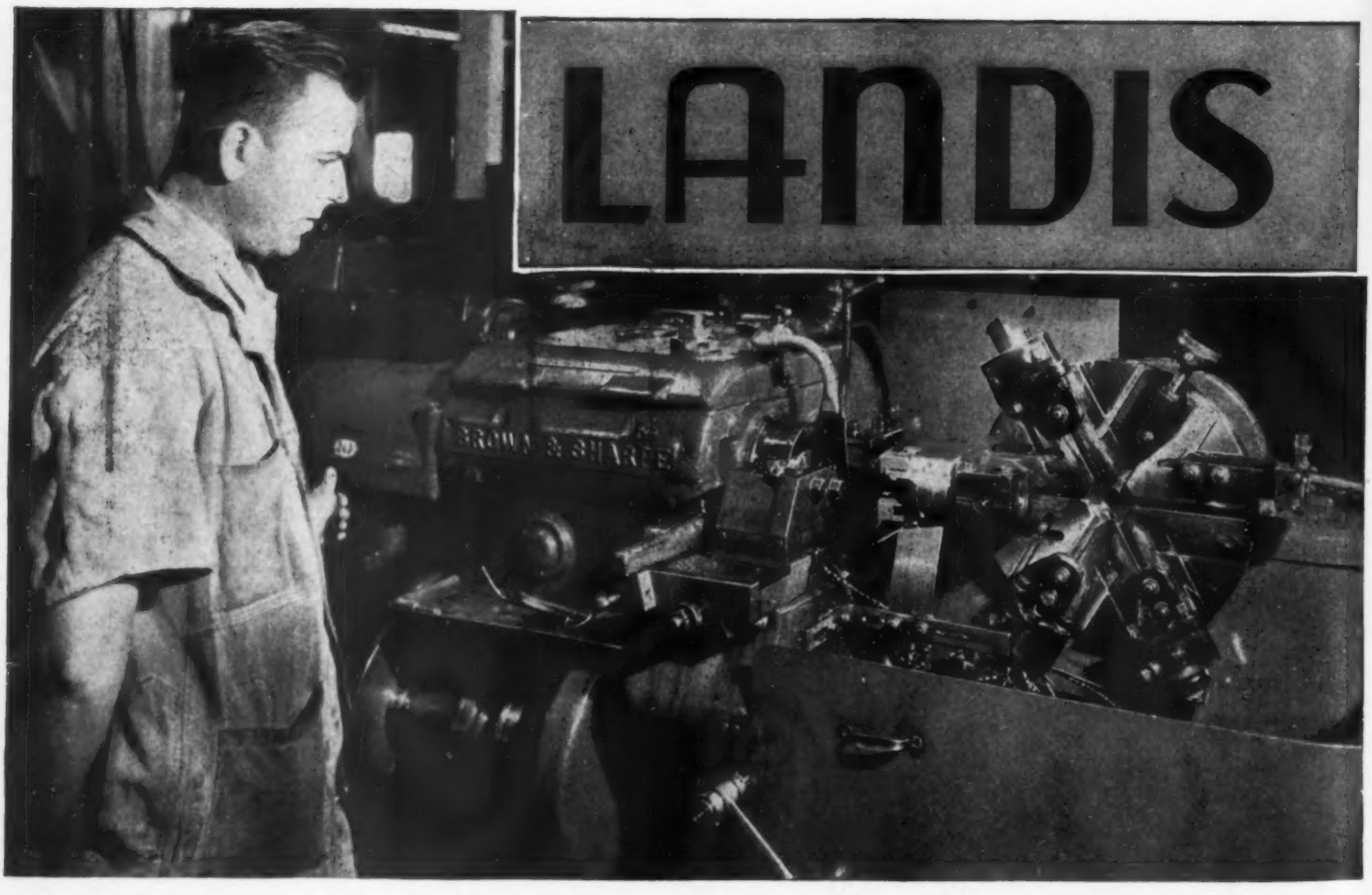
The LANDMACO

THREADING MACHINES AND LANDMATIC HEADS WILL SOLVE YOUR THREADING PROBLEMS

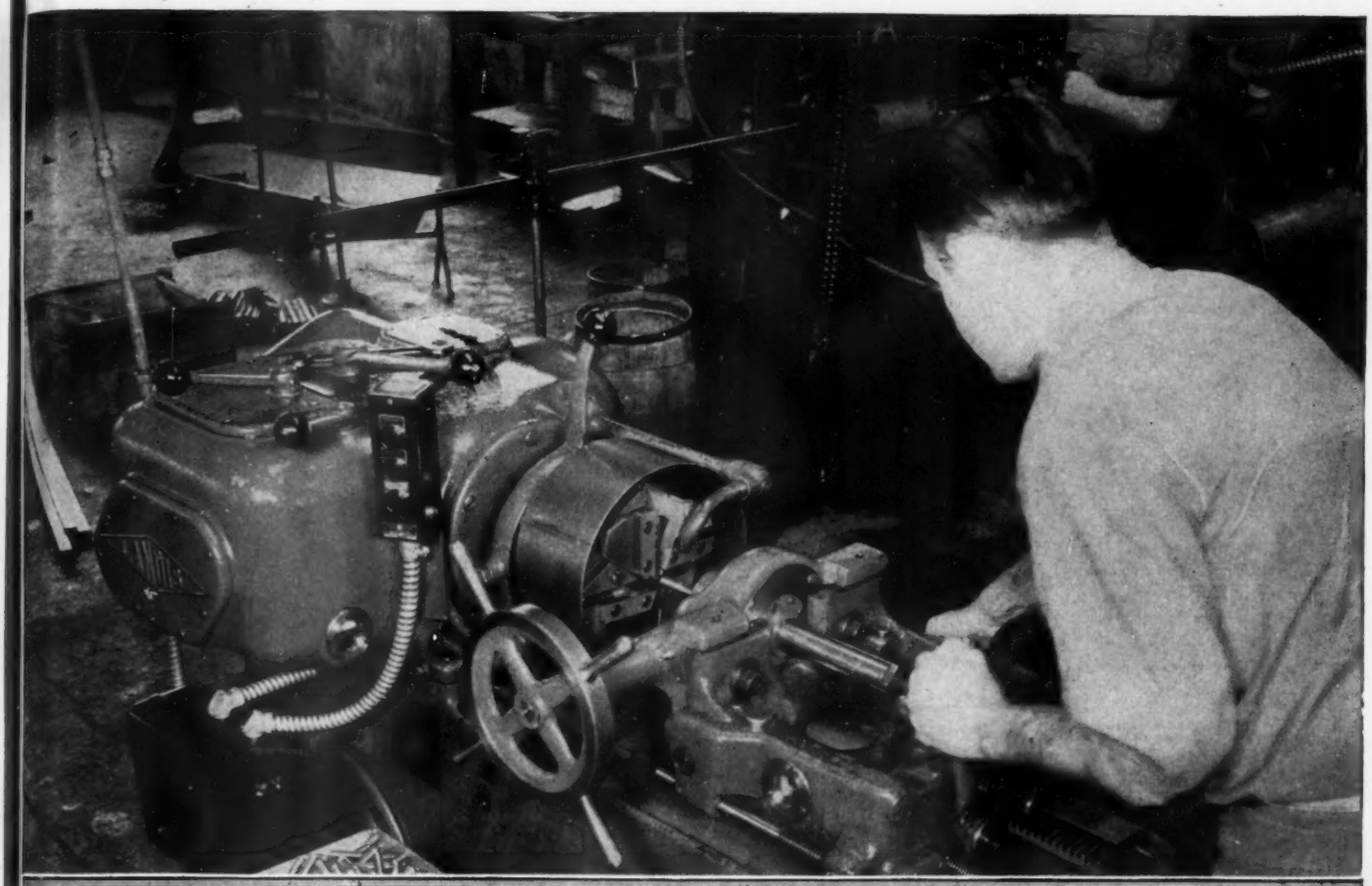
Landis Threading Equipment has been called upon time after time during the past four years to handle Threading jobs that, not so many years ago, would have been impossible.

New products, new uses bring new Threading Demands. Landis Equipment has proven its capacity to handle the unusual—as well as the usual. That knowledge and experience gained during the war years, will help you immeasurably in solving your Threading Problems today.

Write for Bulletin No. H-75



THREAD CUTTING MACHINES • DIE HEADS • COLLAPSIBLE TAPS • THREAD GRINDERS



MACHINE CO. WAYNESBORO PENNA. U.S.A.

Above: The Landmaco Machine illustrated, equipped with the collet type carriage front is threading studs made from alloy steel to class 3 specifications. Eight hundred to one thousand pieces are threaded per grind of the chasers.

Left: The 7/8" Landmatic Head illustrated is producing alloy steel plugs 1½" diameter, 12 threads per inch to class 3 specifications. An average of 1500 plugs are threaded per grind of the chasers.

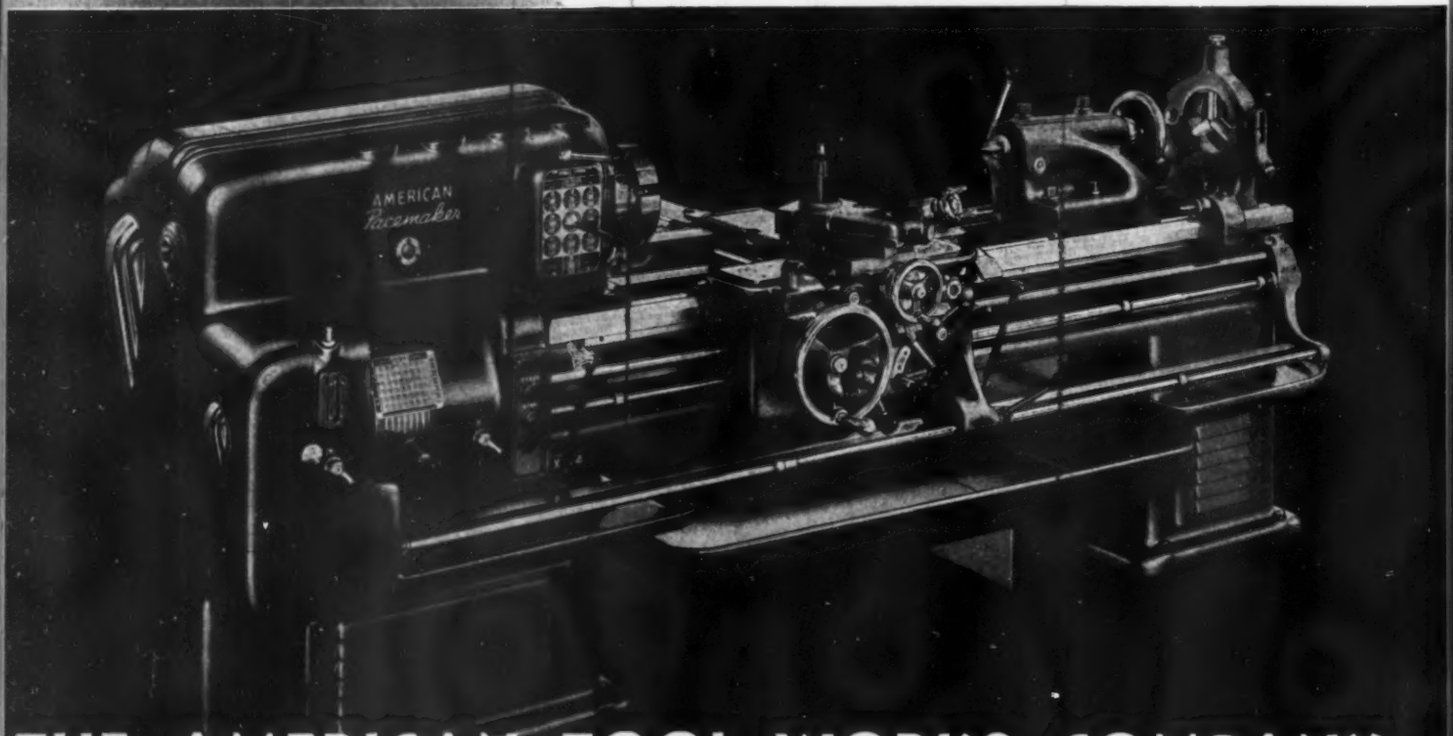
27 Spindle Speeds

with only 2 *control levers*

Convenience of control and ease of operation are two of the outstanding characteristics of the new "American" Pacemaker Lathe.

Imagine being able to secure any one of 27 spindle speeds thru only 2 conveniently placed direct reading levers without having to refer to index plates or having to retain lever positions in one's mind. Operators are enthusiastic in their praise of this new speed control. It makes their work easier; they produce more work because of it and the pay roll dollar buys more as a consequence.

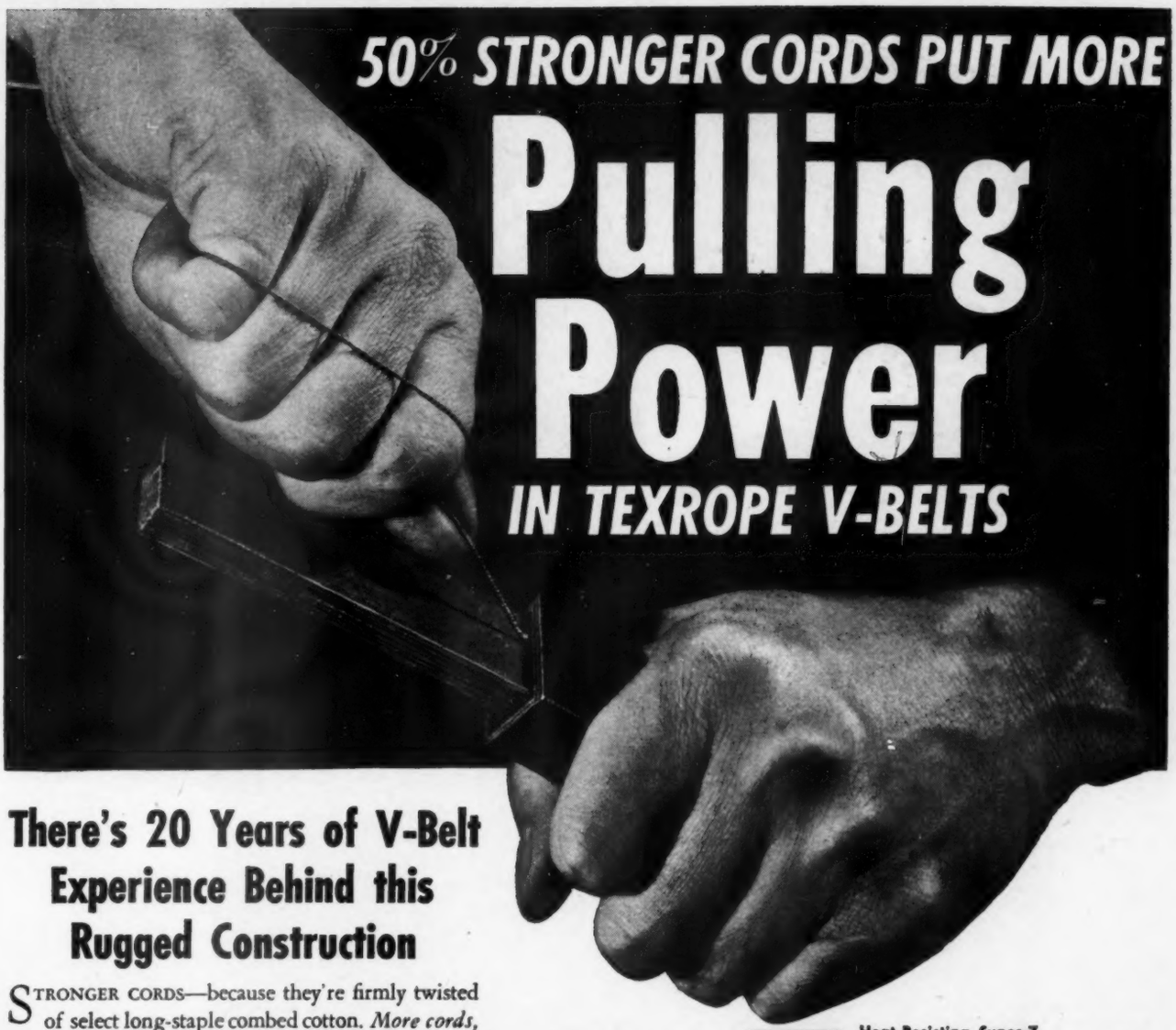
This and other fine features of the "American" Pacemaker are thoroughly covered by Bulletin No. 15.



THE AMERICAN TOOL WORKS COMPANY

LATHES AND RADIAL DRILLS

CINCINNATI, OHIO, U. S. A.



50% STRONGER CORDS PUT MORE Pulling Power IN TEXROPE V-BELTS

There's 20 Years of V-Belt Experience Behind this Rugged Construction

STRONGER CORDS—because they're firmly twisted of select long-staple combed cotton. *More cords,* too — accurately placed to carry heavier loads, and impregnated with gum rubber to absorb friction and heat.

Texrope "Super-7" V-Belts today are the finest in 20 years of continuous development by Allis-Chalmers—originator of the multiple V-Belt drive.

LONG WEARING — COOL RUNNING

Tough duplex cover to take the wear, keep the belt in shape. *Thick cushion* of war-proved Buna-S to protect the cord structure from shock. *Precision molding* to assure accurate section and a smooth running belt. For long service and highest efficiency on ALL V-Belt drives — make A-C your V-Belt headquarters! ALLIS-CHALMERS, Milwaukee 1, Wis.

WHICH OF THESE SUPER-7 V-BELTS DO YOU NEED

TEXROPE offers you the most complete line of V-Belts — types specially developed to meet ALL operating conditions. Pick the right TEXROPE Super-7 V-Belt — it'll give you the most in efficient power transmission.

Heat-Resisting Super-7
Stands temperatures up to 180°. The TEXROPE V-Belt for most drives.

Oil-Resisting Super-7
Neoprene cover protects core against moderately oily or greasy conditions.

Oil-Proof Super-7
Made of Neoprene throughout. Use it when the belt must swim in oil.

Static-Resisting Super-7
Recommended where explosion hazard exists. Static-conducting element throughout cover won't wear off.

Super-7 Steel
Twin steel cables, to pull extremely heavy loads with minimum stretch.

GET THEM — through your Allis-Chalmers district office or dealer.

TEXROPE Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

V-BELTS
TEXROPE complete line — Sizes, types for every power transmission problem and condition.

ALLIS CHALMERS
TEXROPE V-BELT DRIVES
ORIGINATORS OF THE MULTIPLE V-BELT DRIVE

SHEAVES
"MAGIC-GRIP" . . . TEX-STEEL . . . TEXDRIVE . . . Speed changers and VARI-PITCH sheaves.

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*

A 2009

LEADS IN APPEARANCE

The clean, modern lines of the new Landis Tool Centerless Grinder are the result of the correct functional design. Operating parts are located exactly where they should be for best performance. The grinding wheel is located on the right of the operator for more convenient checking of the work. Driving motors mounted on self-contained wheel bases give greater rigidity and ease of adjustment. Enclosure of operating parts protects against damage. Hinged openings permit easy access to all operating parts for inspection or maintenance.

LANDIS TOOL

Precision Grinders

LANDIS TOOL COMPANY

LEADS IN PERFORMANCE

LEADS IN APPEARANCE

LEADS IN PERFORMANCE

New, modern features make possible the superior finishes and high production that give the Landis Tool Centerless leadership in performance. These include: Faster stock removal to close limits and fine finish by rigid support of work in guide that extends up to center line of regulating wheel spindle • Simple rheostat controlled adjustable speed drive • Screw traverse adjustment of regulating wheel base for rapid, accurate wheel alignment • Tilting regulating wheel base for through feed grinding • Swiveling regulating wheel base for grinding tapers • Quick, easy setup of single work rest for parallel or tapered work • Single, convenient valve at operator position controls coolant for grinding and dressing.

Closeup of grinding wheel shows hydraulically controlled diamond dresser with earphone to determine when diamond is in contact with wheel.

LEADS IN DESIGN

New and advanced features have given LANDIS TOOL immediate leadership in centerless grinders. These include specific advances in the design of grinding wheel base, grinding wheel truing device, work rest, regulating wheel and hydraulic system, lubricating system, coolant system and electric controls. Outstanding are: Wheel dressed at exact point of work contact by hydraulic traverse of rigidly mounted diamond • Hydraulically controlled grinding wheel dresser accessible from operator position. Earphone to determine when diamond is in contact with wheel • Conveniently grouped main controls with master stop button for instantaneous control • Three position selector switch controls machine for "setup", "dress" and "grind" • Grinding wheel base adjustable to compensate for wheel wear and varying work diameter.

16

For complete information on the No. 12 Centerless Grinder, write for a copy of Catalog T44. Landis Tool Company, Waynesboro, Pa.

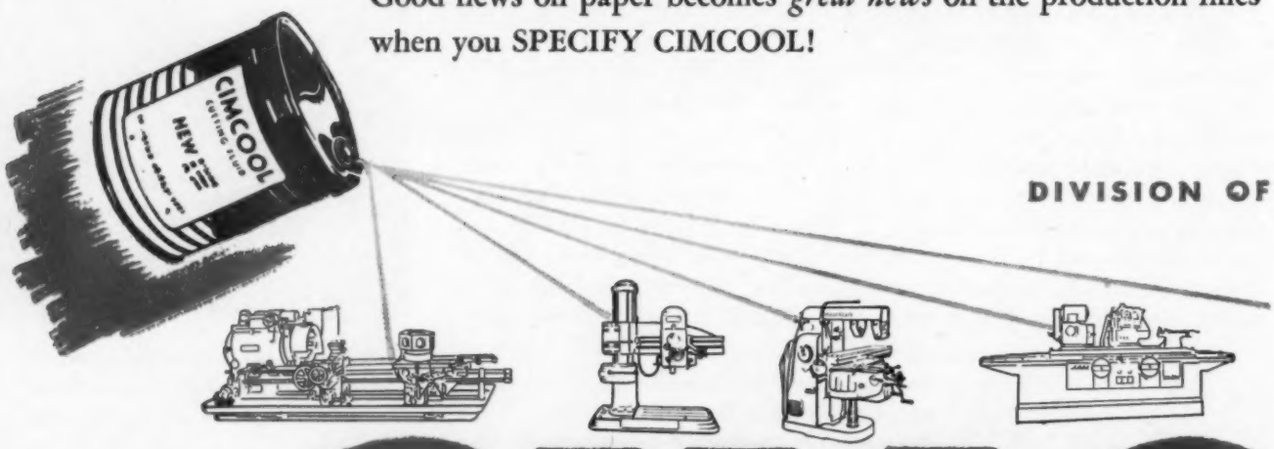
LANDIS TOOL Company

WAYNESBORO, PENNA.

FLASH!

...NEW CUTTING FLUID COVERS 85 PERCENT OF ALL METAL-WORKING JOBS!

No wonder production-wise plant executives are pricking up their ears! The reason is CIMCOOL—the cutting fluid that gives *new meaning* to *"multi-purpose."* It's welcome news when one cutting fluid covers *eighty-five percent* of all metal-working jobs! And it's better still when that cutting fluid combines *high cooling capacity* with *high friction reduction* in a degree never before attained! Good news on paper becomes *great news* on the production lines when you SPECIFY CIMCOOL!

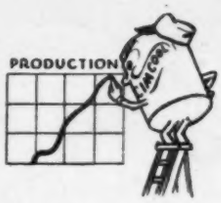


DIVISION OF

★CIMC

Why CIMCOOL Provides the Lowest Unit Cutting Fluid Cost

CIMCOOL helps increase production rates. Increased cooling capacity permits higher cutting speeds and feeds. Grinding wheels cut more freely. Low surface tension allows small chips and grit to settle out rapidly.

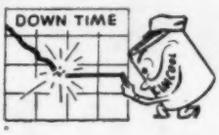


CIMCOOL is tops with operators. It restricts bacterial growth, does not contain animal or vegetable oils subject to rancidity, and is not a skin irritant. Smoke, objectionable odors and hot chips are eliminated.

CIMCOOL helps increase tool life. Chemical lubricity reduces tool wear. Tools are kept cool to touch. Increased wetting action permits greater penetration between tool and chip.

CIMCOOL is safest. Fire hazards are eliminated. Absence of slippery film on operator's hands, machine controls, work and floor reduces danger of accidents. Restriction of bacterial growth limits risk of infection.

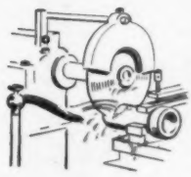
CIMCOOL reduces down-time on machines. Fewer tool changes and fewer changes of cutting fluid are necessary. Pump and supply lines are kept clean. No spoilage.



CIMCOOL contains a rust inhibitor good for the life of the fluid for protection of machine and work. It does not contain any chromates or highly alkaline components which may be irritating.

CIMCOOL facilitates accuracy. Freer cutting reduces pressure. Uniform temperature is maintained on work and on machine. Dirt does not stick to work or gages, permitting faster, more accurate gaging.

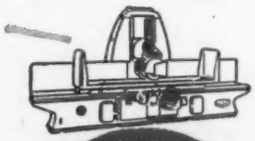
CIMCOOL is applicable to 85% of all metal-working operations requiring cutting fluids. It replaces all water emulsions and all but very highly compounded specialty oils for selected jobs.



A case in point . . . The Leland Electric Company of Dayton, Ohio, users of CIMCOOL in their tool room and machine shops, report that elimination of foreign deposits and rancidity has effected a *50 percent reduction* in "down-time" per machine. With CIMCOOL on a cut-off wheel operation, they report an average production of *450 pieces* per wheel dressing—200 pieces over the former average. Further, no case of dermatitis has been reported for seven months. Citing savings in money, man-hours, efficiency and workers' health, company officials declare, "CIMCOOL is by far the best cutting fluid we have ever used!"

THE CINCINNATI MILLING MACHINE COMPANY Cincinnati 9, Ohio, U.S.A.

The Multi-Purpose Cutting Fluid



OOL

Check • Clip • Mail

Manager, CIMCOOL Division AM-4
Cincinnati Milling Machine Co.
Cincinnati 9, Ohio, U.S.A.

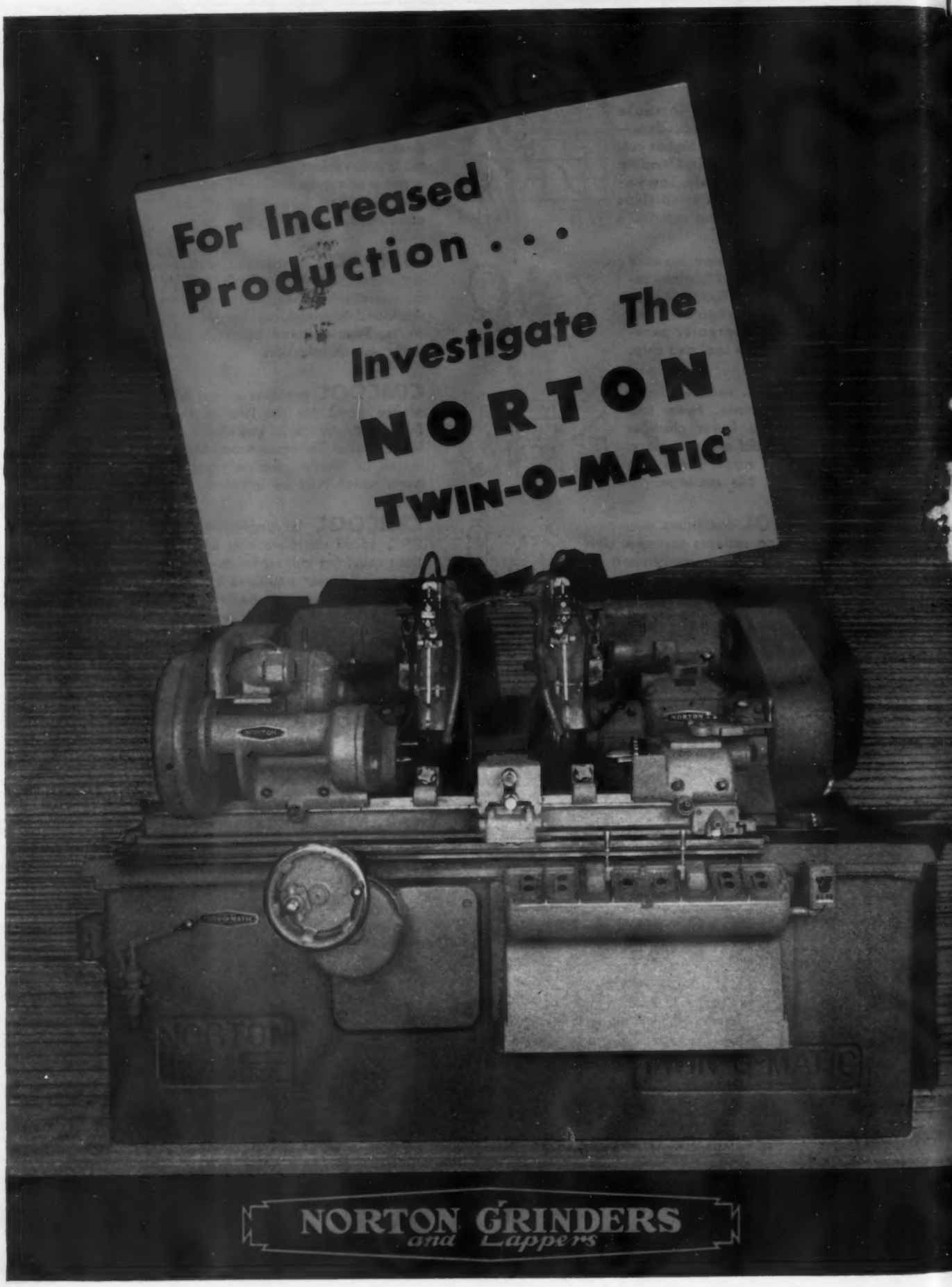
_____Please send me a copy of "What Is Cimcool?"

_____Please have sales representative call.

Name_____

Company_____.

City_____ State_____.


For Increased Production . . .
Investigate The
NORTON
TWIN-O-MATIC®
NORTON GRINDERS
and Lappers

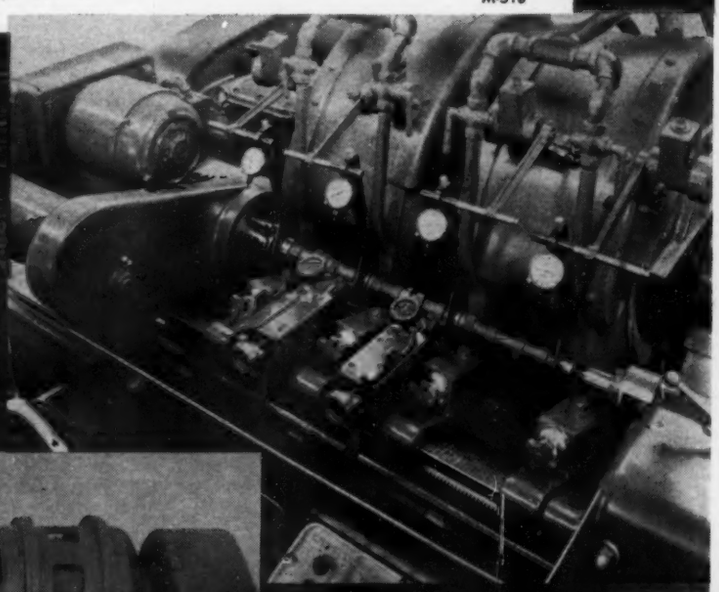
THE NORTON 10" TWIN-O-MATIC* with dual wheel heads, each individually controlled, presents a rapid means of handling many types of multidiameter, plunge-grind work. Let us analyze your problem and see if the NORTON TWIN-O-MATIC* is the answer.

NORTON COMPANY • WORCESTER 6, MASS.

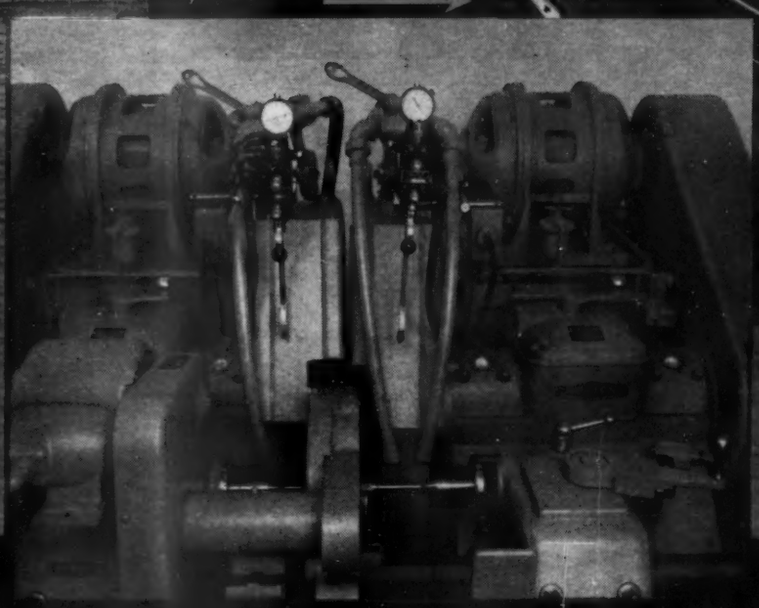
Distributors in All Principal Cities

*Registered trade-mark

M-518



Detailed view of table showing gages, work loading carriages, steadyrests, and diamond tool holders—camshaft in place ready for grinding bearings.



A 10" x 36" Twin-O-Matic arranged for grinding rotor shafts and using special center-drive device.

BARBER-COLMAN

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

B-C THREAD MILLING CUTTERS
SELECTED FOR UNIFORMITY AND ACCURACY OF THREADS

These aircraft piston gasket nuts had to be freely interchangeable for replacement purposes. To accomplish this the accuracy of the threads had to be right. Barber-Colman Thread Milling Cutters were selected for the job because they consistently produced accurate uniform threads throughout the life of the cutters.

These specially heat-treated ground thread mills not only produced results but contributed long cutter life, with reduced tool costs. Threads were milled in tough alloy steel, 43 Rock well, with frequent hard spots. Length of cutter travel per each piece was 29", with 27 pieces per sharpening, or a total of 675 lineal inches of thread per sharpening. Use BARBER-COLMAN Thread Mills for your next thread milling jobs. Take advantage of these extra "plus" values.

Have you a copy of
"FACTS ABOUT THREAD MILLS?"

Here is an informative book, specially written to show how to use, plan for, and order Thread Milling Cutters. A request on your Company letterhead will bring you a copy promptly.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

The New HARDINGE High Speed Precision Second Operation Machine

HARDINGE
ELMIRA, N.Y.

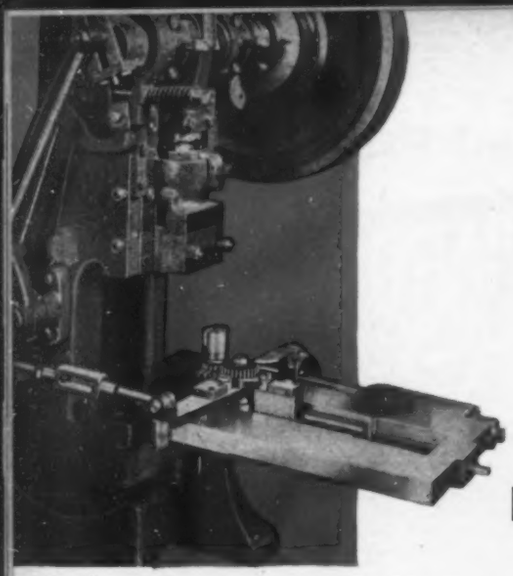
Features:

1" Collet Capacity
6" Step Chuck Capacity
5" Jaw Chuck Capacity
Speeds to 4000 r.p.m.

The above features assure sustained accuracy. The performance features of the previous model have been retained. This is the outstanding machine for high speed production of second operation work. Ask for bulletin DSM 59.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

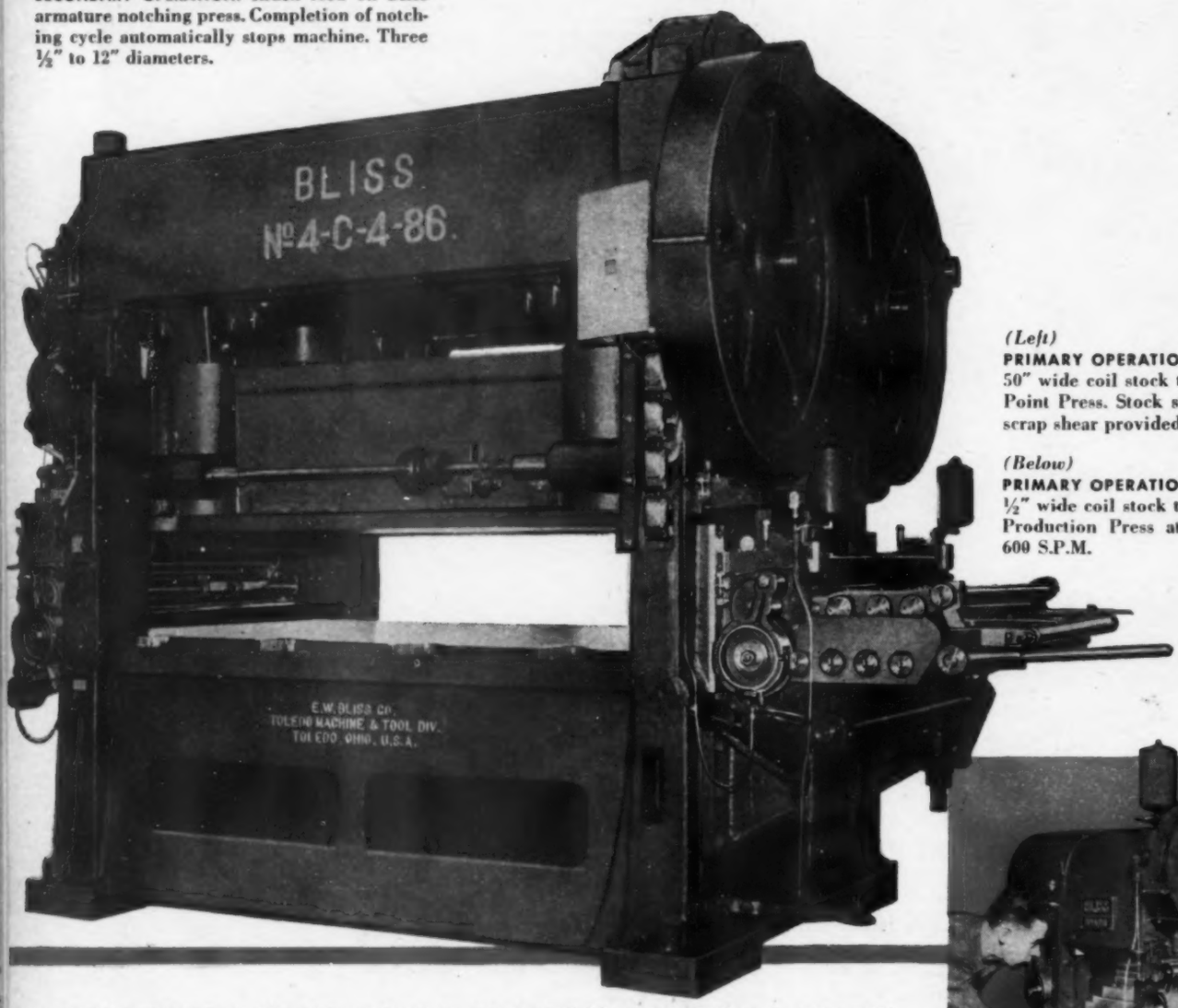
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



IT'S THE *Right Feeding*

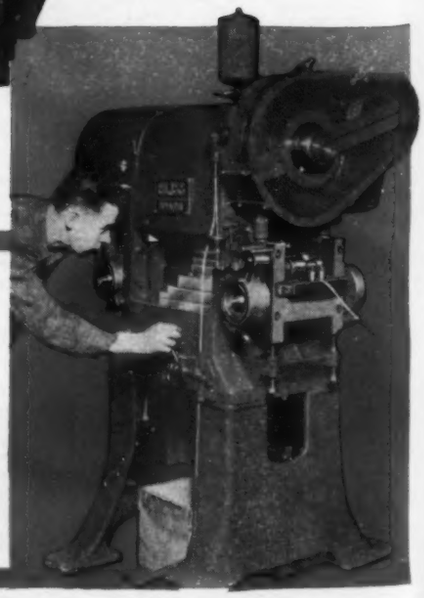
Here's how you can cut costs and increase production with Bliss Automatic Handling Equipment

SECONDARY OPERATION: Index feed on Bliss armature notching press. Completion of notching cycle automatically stops machine. Three ½" to 12" diameters.



(Left)
PRIMARY OPERATION: Roll-feeding 50" wide coil stock to a Bliss Four-Point Press. Stock straightener and scrap shear provided.

(Below)
PRIMARY OPERATION: Roll-feeding ½" wide coil stock to a Bliss High-Production Press at speeds up to 600 S.P.M.



BLISS FEEDS YOUR PRESS FROM ½" TO 50" OR MORE

ON PRIMARY OPERATIONS: Single, compound or progressive-die work is made fully automatic by the use of Bliss roll or grip feeds for high-speed operation on coil stock. Stock straighteners, scrap shears, and other accessories, all driven and timed from the press, are also available.

ON SECONDARY OPERATIONS: Blanks and preformed items for notching, forming, piercing, trimming and assembling can be fed automatically. Bliss dial feeds, magazine feeds and transfer feeds, operating singly or in combination, will minimize material handling and rejection—boost production.

BLISS BUILDS MORE TYPES AND SIZES OF

Time FOR PRESSES!

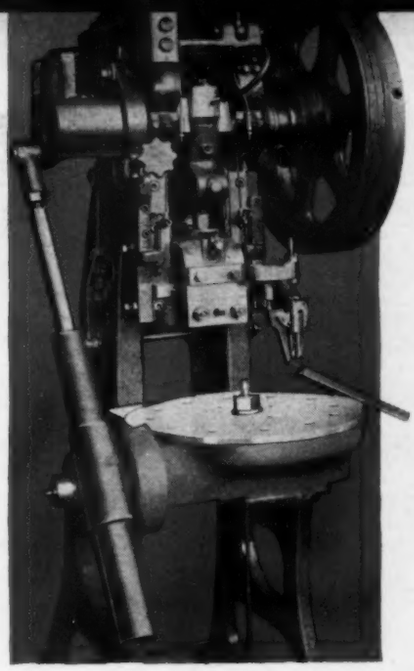
WHETHER your press work is large or small—coiled, blanked or preformed stock from a half-inch to 50 inches wide or more—the chances are good that you can cut handling costs and step up output substantially by the use of a Bliss automatic feed. And now is the time to do it, for in periods of rising material and labor costs it's man-hour *productivity* that determines profits.

There is a Bliss feed available for practically every primary or secondary press operation. The wide range of applications is illustrated on these pages... working on Bliss presses of various sizes and shapes built for special work in recent months.

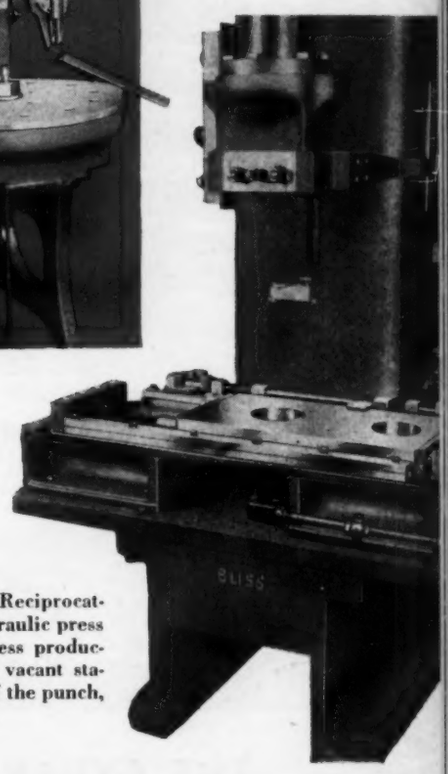
The Bliss sales engineer in your territory will be glad to discuss your feeding application. He has the "know-how," backed by Bliss' extensive experience with all types and sizes of mechanical and hydraulic presses, to solve your problem. Send for him today!

E. W. BLISS COMPANY, BROOKLYN 32, N. Y.

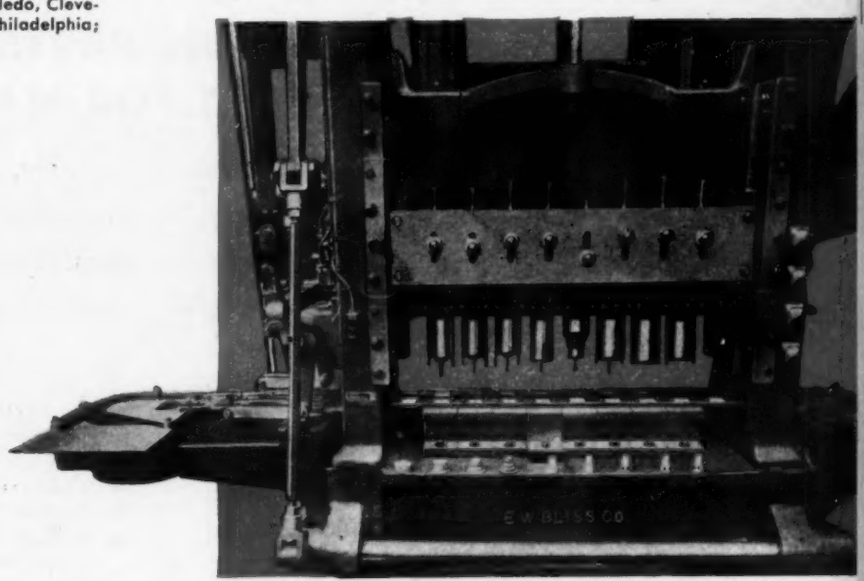
WORKS AT: Brooklyn; Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Derby, England; Paris, France. SALES OFFICES: Brooklyn; Toledo, Cleveland, Dayton, Ohio; Detroit, Lansing, Mich.; Chicago; Philadelphia; Rochester; New Haven; Boston; Toronto.



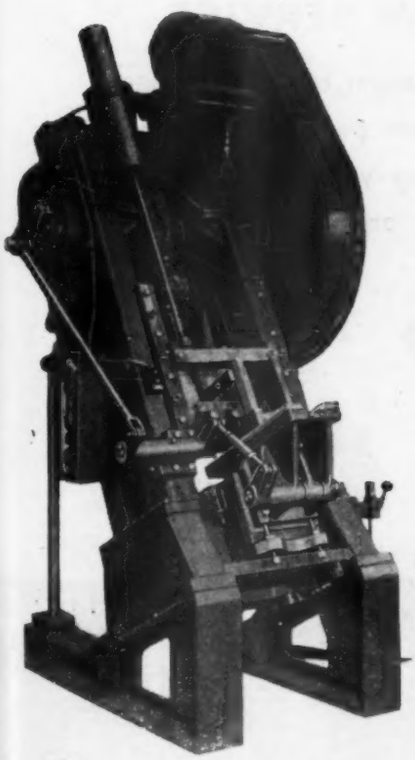
SECONDARY OPERATION: I station dial feed to accomm date pre-formed cups for co tinuous operation on a stan ard Bliss inclinable pre Three standard sizes fit Bliss inclinables.



MATERIAL HANDLING: Reciprocating feed on Bliss hydraulic press assures maximum press production. Operator loads vacant station out of the way of the punch, while press operates.



SECONDARY OPERATION: Combination dial and transfer feed, carrying previously annealed blanks automatically through 8 progressive stations of a Bliss double-crank press.

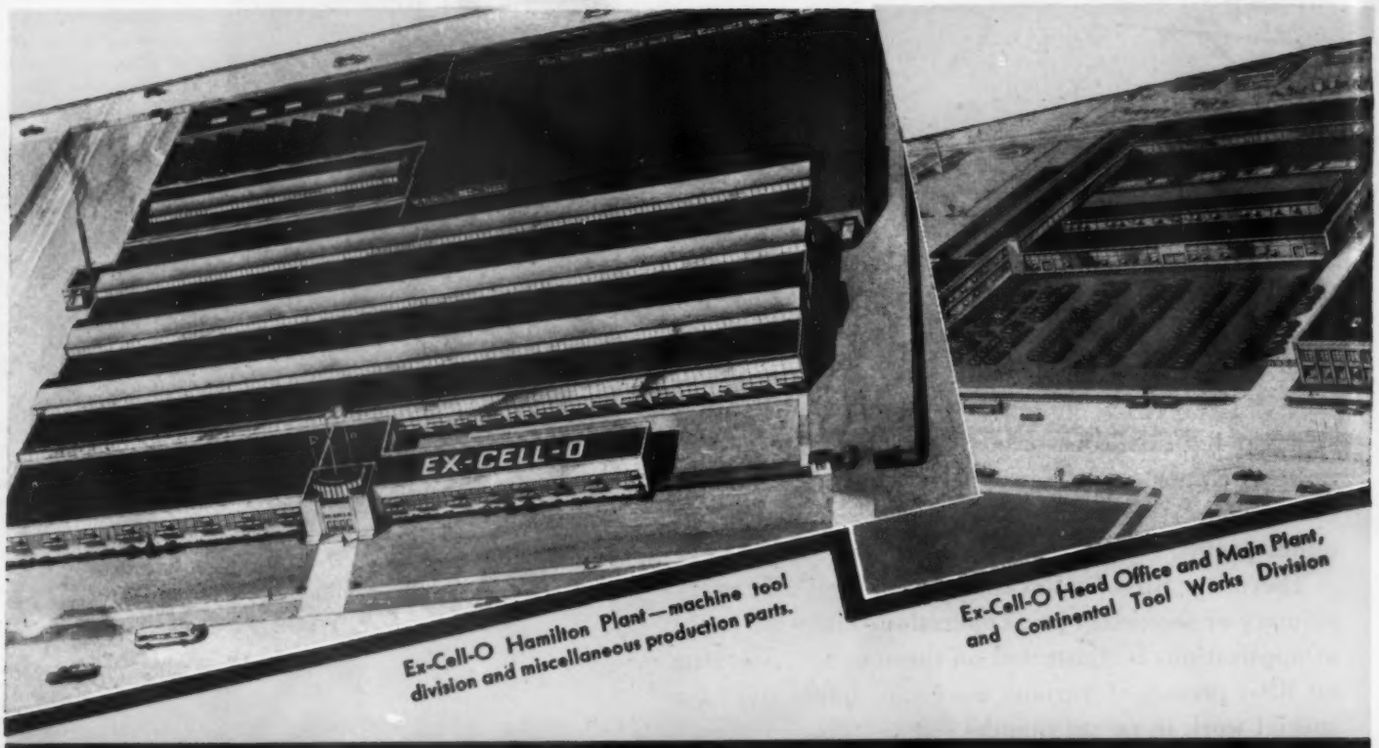


SECONDARY OPERATION: Motor lamination blanks being fed from a magazine feed into notching die. 90 S.P.M., continuous operation, of a Bliss single-crank press.

AND FEEDS

PRESSES THAN ANY OTHER COMPANY

STAY AHEAD WITH *Bliss*



Ex-Cell-O Hamilton Plant—machine tool division and miscellaneous production parts.

Ex-Cell-O Head Office and Main Plant, and Continental Tool Works Division

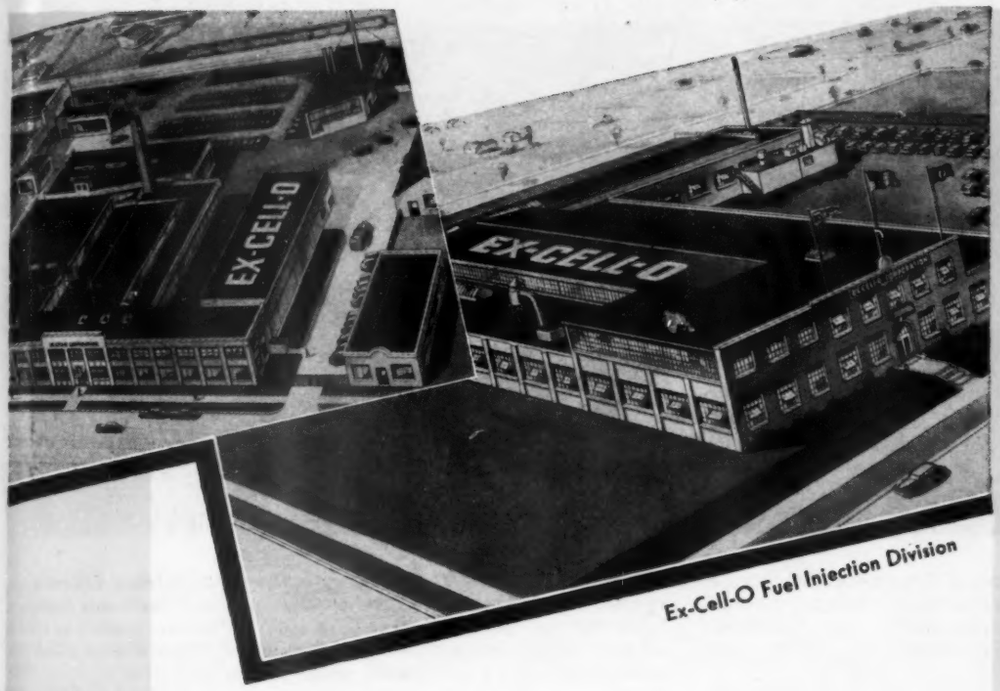
Ready to Serve You With

THE EXPERIENCE AND THE FACILITIES TO MAKE ACCURATE PRODUCTION PARTS FOR YOUR PRODUCT AT MINIMUM COST FOR MAXIMUM SERVICE

Many years of experience in producing machine tools noted for their accuracy and dependability . . . plus complete and modern production facilities . . . enable Ex-Cell-O to supply you with production parts on an economical quantity basis. Ex-Cell-O provides widely experienced engineers, the most up-to-date machining, heat-treating, grinding, assembling, and inspection processes . . . all under one management. If your product calls for quantity production of accurate parts or sub-assemblies, Ex-Cell-O offers you maximum service at minimum cost. Contact Ex-Cell-O today.

Folder illustrating Ex-Cell-O's parts production facilities will be sent you upon request. Write or wire Ex-Cell-O today and ask for Ex-Cell-O Bulletin No. 36151.

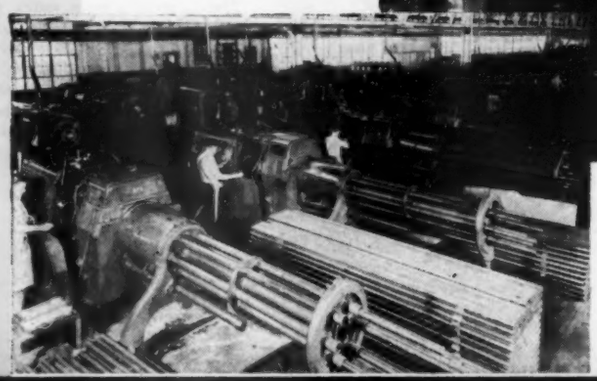
EX-CELL-O CORPORATION



Ex-Cell-O Fuel Injection Division

MEN . . . MACHINES . . . MANAGEMENT

One of many production lines at Ex-Cell-O where sequence of operations is efficiently engineered for low-cost production.



Multiple spindle automatic screw machines roughing out miscellaneous parts from tubing and bar stock at Ex-Cell-O.

DETROIT 6, MICH.

XLO

EX-CELL-O *for* PRECISION

EX-CELL-O's Precision Production Parts *facilities:*

PRODUCTION ENGINEERING

The Ex-Cell-O organization, with skill, facilities and modern methods that have made a wartime record, can make an important contribution in the planning of quantity production of quality parts and unit assemblies for your postwar product.

PRODUCTION MACHINES

- Multiple Vertical Turret Lathes
- Multiple Spindle Automatic Screw Machines
- Single Spindle Automatic Screw Machines
- Hand Screw Machines
- Engine Lathes
- Centerless O.D. Grinders
- Centerless I.D. Grinders
- Single and Multiple Spindle Drilling Equipment
- Form Grinding Machines
- Plain O.D. Grinders
- Plain I.D. Grinders
- Surface Grinders (Plain and Rotary)
- Milling Machines
- Thread Milling Machines
- Broaching Machines (Vertical and Horizontal)
- Precision Thread Grinders
- Thread Rolling Machines
- Precision Boring Machines
- Lapping Machines
- Special High Production Equipment

HEAT TREAT

- Induction Heat Treating
- Laboratory for Heat Treat Control including Micro Examination and Photography
- Atmosphere Control Continuous Hardening Furnaces
- Atmosphere Control Box Hardening Furnaces
- Various Types of Air-Draw Batch Type Furnaces
- Gas Carburize Furnaces
- Box Carburize Furnaces
- Pack Anneal Furnaces
- Nitriding Furnaces
- Cyanide, Lead, and Neutral Salt Pot Furnaces
- High Speed Steel Atmosphere Control
- Vertical and Horizontal Hardening Furnaces
- Continuous Air-Draw Furnaces
- Sub-Zero Heat Treating Equipment

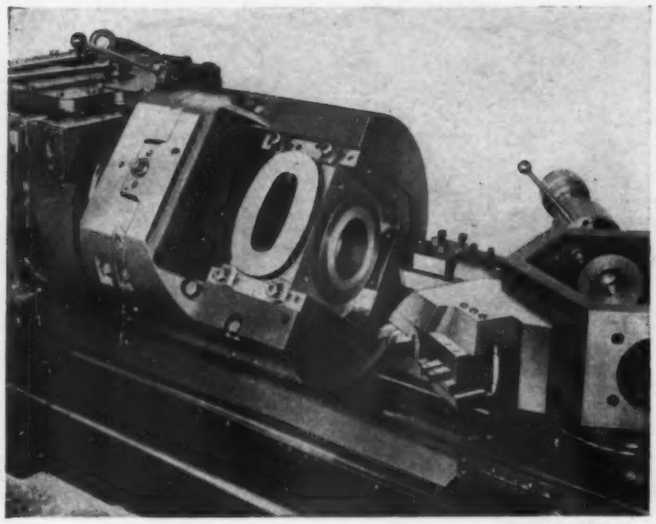
UNIT ASSEMBLIES

For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

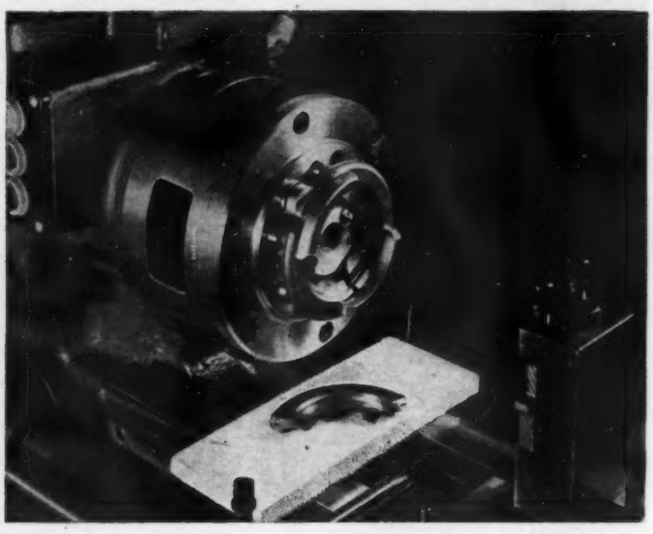
INSPECTION

Ex-Cell-O has always maintained that quality in a product is not the result of accident; that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process.

46—40



A 2450 LB. INDEXING CHUCK *on a Warner & Swasey 4-A Turret Lathe handles several sizes of steel gate valve bodies. The 20° tapered valve seat inside the valve, and the three exterior right angle faces are finish machined; valve seats are inserted and finished—all in one operation.*

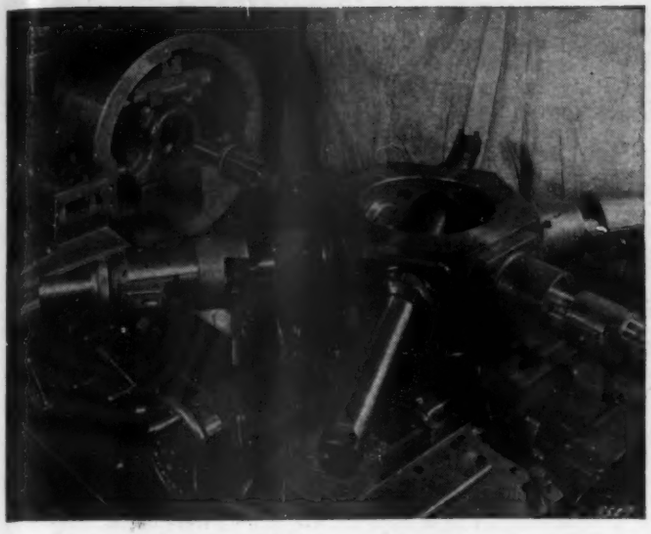


THIS SPECIAL HOLDING FIXTURE *with Air Operated Holding Clamps on a Warner & Swasey No. 3 Universal Turret Lathe machines two typewriter type bar segments at once. Parts are faced, bored, recessed and chamfered on the inside surfaces, and grooved with ball form at bottom on the outside radius—all in one setup.*

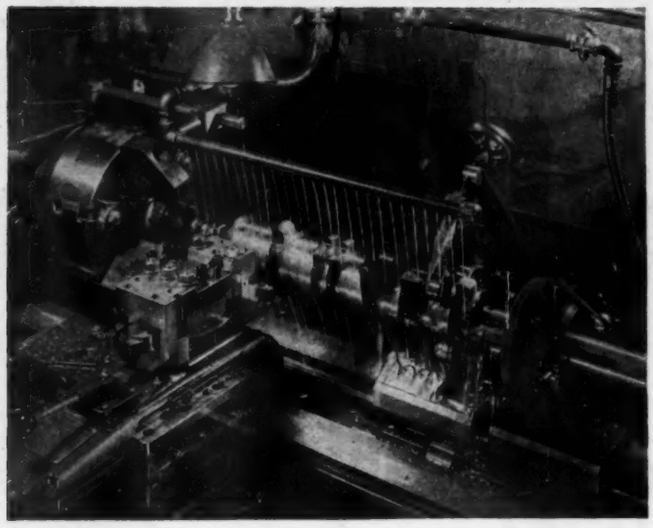
Warner & Swasey offers you assistance on special tooling problems

THE ENGINEERING DEPARTMENT *at Warner & Swasey devoted to the design of special tooling for purchasers of Warner & Swasey Turret Lathes, Precision Tapping and Threading machines, and 5-Spindle Automatics. Here, production rates of tools are methodically estimated prior to manufacture. Special tools are usually tested on customers' samples at Warner & Swasey to make sure that estimates can be met.*

TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES



SELF-ALIGNING SHAFT BRACKETS *are spherically bored by these special boring bars on a Warner & Swasey 4-A Turret Lathe with Cross Sliding Hex Turret. Bars float axially in flanged tool holders, thrusting against pilot bushing in the spindle. The cutter blocks are rotated inside the bracket casting to machine an accurate sphere to close tolerances.*



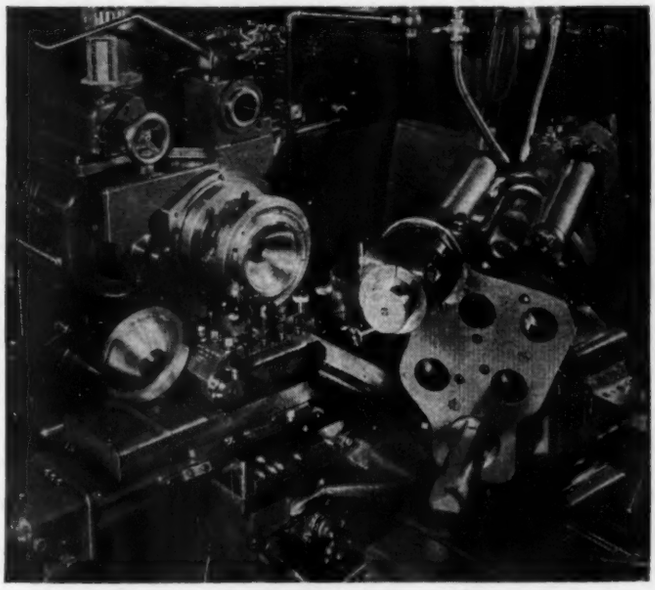
THE TURNING, BORING AND FACING OPERATIONS *on this aircraft cylinder tube are done simultaneously on a Warner & Swasey 2-A Long Bed Turret Lathe. A steady rest supports the steel forging; another supports the external pilots of the drilling and boring bars. Note external coolant supply pipe; oil under pressure is also forced through the boring bars to flush out chips and cool the cutters.*

THE big majority of turning jobs can be handled easily with Warner & Swasey Standard Bar and Chucking Tools.

Every so often however, the setup man or tool designer is confronted with a specific production job which may be produced faster at lower cost with special holding devices, contour cutters, boring bars, cutter holders, etc.

A separate engineering department at Warner & Swasey devotes itself exclusively to such tool design. It can draw upon the experiences of working with many other shops over the years.

Perhaps we can help you by studying your specific jobs and making definite recommendations. Write us . . . or contact your nearest Warner & Swasey branch office.



THE DIFFICULT CURVES *of stainless steel molds for automobile head lamps are machined to a high finish on a volume basis on a Warner & Swasey 2-A Turret Lathe using special tools. Here is shown the setup for turning, facing, boring, forming and spherically facing the concave mold.*

The complete line of standard Turret Lathe tools is described in the Warner & Swasey Tool Catalog. It is offered free to turret lathe users. If you do not have a copy write

WARNER & SWASEY
Machine Tools
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

"MAGIC-GRIP" FITS...even on Oversize or Undersize Shafts

"Magic-Grip" sheave needs no reaming, no filing, no sledge hammer on oversize shafts . . . grips undersize shafts without weave or wobble. And . . . you need no wheel puller to get it off.

The secret is in patented hub construction. This "Magic-Grip" sheave comes fully assembled, with tapered split bushing of generous clearance for oversize shafts. Yet . . . when you tighten three cap screws, it locks on the shaft with the grip of a vise.

There's no struggle. Anyone can mount this sheave quickly, easily, accurately. It saves time, labor and money . . . can't damage shaft . . . prolongs bearing life because it mounts close, reduces overhang and vibration. And these advantages cost you nothing extra!

YOUR V-BELT DRIVE HEADQUARTERS

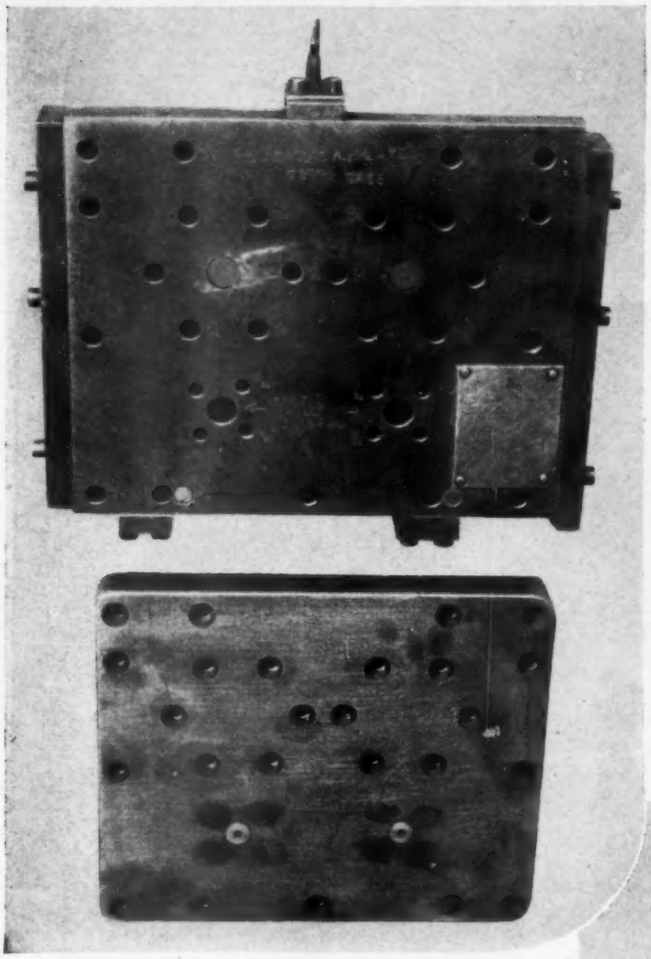
Call your nearest Allis-Chalmers office or dealer for TEXROPE "Magic-Grip" sheaves, Texsteel, Texdrive and Vari-Pitch sheaves, Speed Changers and famous TEXROPE Super-7 V-Belts. Full range of types and sizes. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 2036

ALLIS CHALMERS TEXROPE V-BELT DRIVES

HEAR THE BOSTON "POPS": *Every Saturday Evening, American Broadcasting Co.*

38 Holes in 59 minutes on a FOSDICK Hydraulic RADIAL



● This job demonstrates the speed with which a wide range of drilling can be handled on a Fosdick Hydraulic Radial.

On the work shown a jig was used to speed up hole location. 25 holes were drilled to 13/32" dia. then counterbored to 19/32" dia. to a depth of 3/8". 8 holes were drilled 9/32" dia. with 13/32" dia. counterbored to 1/4" depth. 4-7/16" holes and 1-21/64" hole were drilled in the edge of the work and the entire job was completed in 59 minutes.

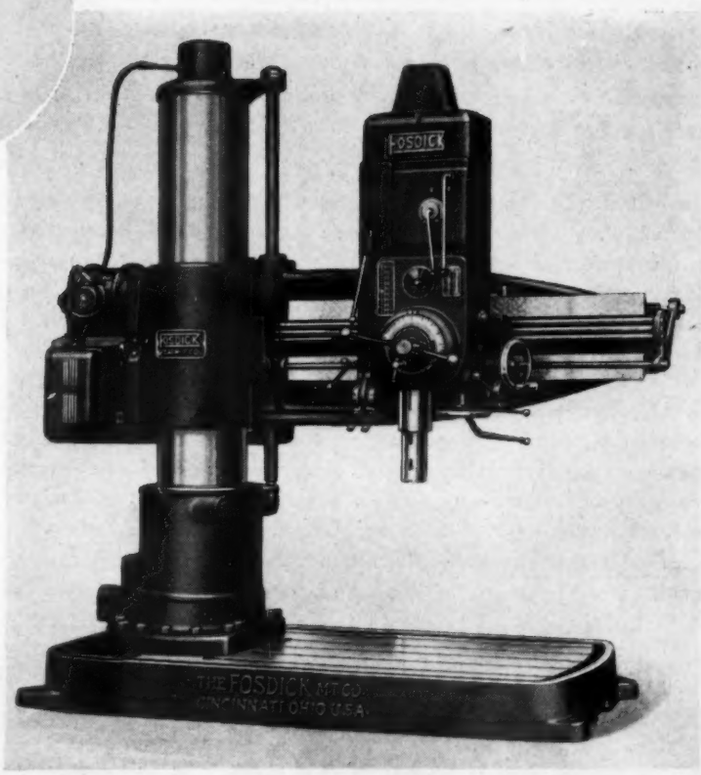
For speed—high production—and ultimate economy put your next radial job on a Fosdick.

At the top is shown the jig used for holding work and locating holes to be drilled and counterbored. Below is the job itself after drilling and counterboring.

* * *

THE FOSDICK HYDRAULIC RADIAL BULLETIN A.M.R. shows the rigid construction features of this machine, explains in detail its hydraulic functions and contains other information of interest to anyone contemplating the purchase of a Radial Drill. Write for a copy today.

FURNISHED in 3, 4, 5, 6, 7 and 8 foot arms with various column diameters from 11" to 19" depending upon machine size and reach requirements.



FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

TWO HEADS ARE BETTER THAN ONE IN MULTIPLE PRECISION GRINDING

When Fitchburg engineers put their heads to the "grindstone" to develop a method that would cut costs on precision grinding as multiple tooling has on machined work, they emerged with a revolutionary idea. This new design not only makes other equipment obsolete — it also prevents its own obsolescence by its unique engineering feature!

The basis of this Fitchburg method is an independent standard interchangeable grinding head which may be mounted singly or in multiples on standard or special equipment, and may be regrouped and remounted on standard machines or on new special bases, for operations other than the one originally specified. Mounted singly, it can perform more jobs than was thought previously possible — straight or bevel gears, internal or external gears, etc. — due to its independent positioning and its ability to be set at any angle the work requires. Mounted in multiples, its production uses are even greater.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Fitchburg Double-Head Grinder and Polisher for Gear Shift Grooves* is typical of many special Fitchburg machines into which independent Fitchburg heads can be built to cut costs through multiple automatic grinding on mass production. One grinding wheel rapidly traverses into the slot and then an automatic side wheel motion grinds one side of the slot, then the other. Meanwhile, the other grinding wheel comes in and finish-polishes the first side ground, then the second side which has just been ground. This is an automatic cycle from start to finish.

Write Today for Catalog—Sent Free Upon Request

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

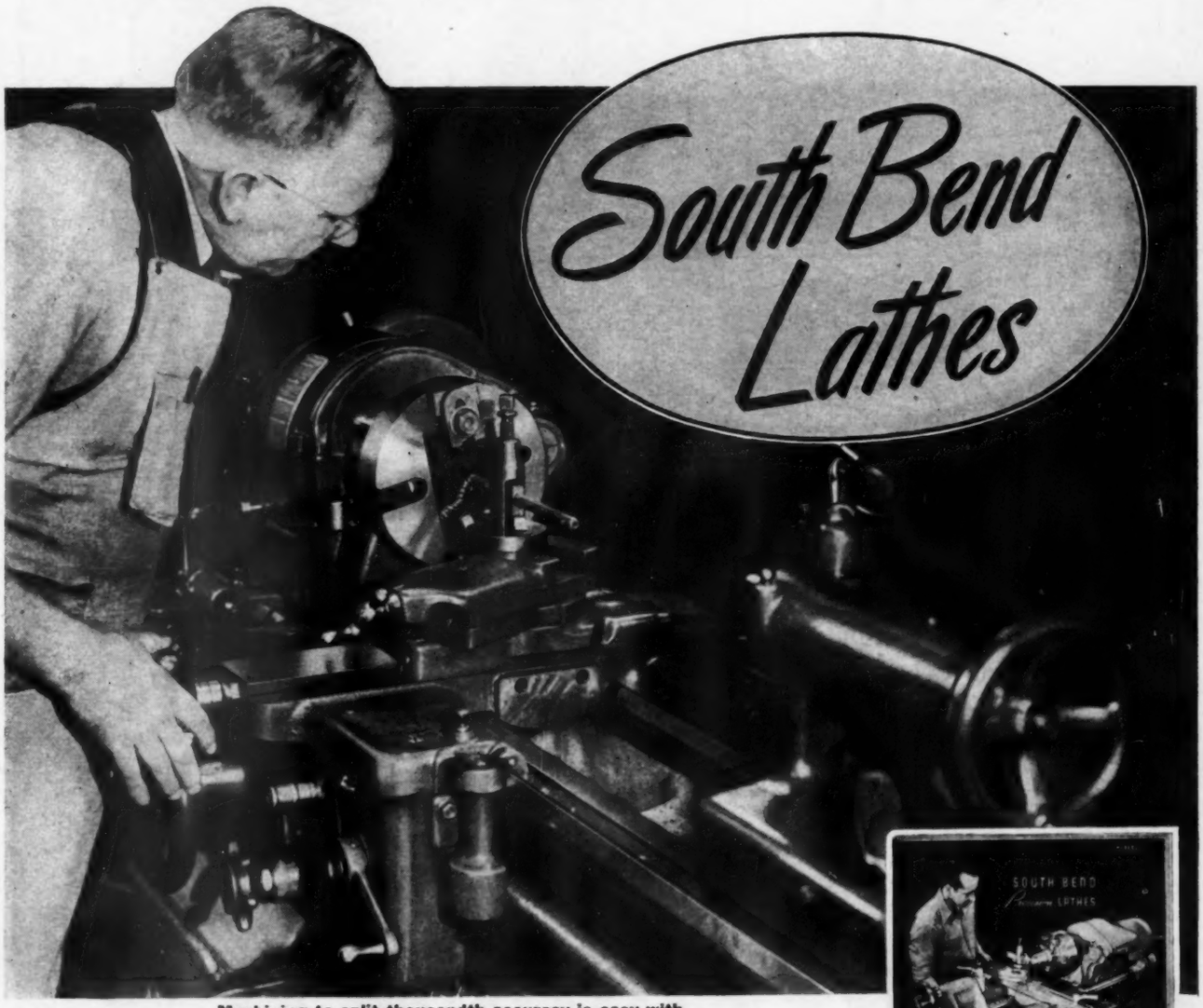
Increase Shop Capacity and Efficiency

Increase shop efficiency and you increase production capacity. Work moves smoothly, swiftly, surely, and in greater volume, through the efficient shop. Modern, efficient, precision machine tools are one of the first essentials for maximum efficiency.

Famous for versatility, South Bend Precision Lathes bring peak efficiency to shops where frequent changes of set-up are called for and a variety of materials are used. And their modern design, with convenient controls and full quick change gear equipment, means less fatigue and less "machine scrap" due to such causes.

If your shop problem is to increase efficiency, it will pay to consider the installation of South Bend Precision Lathes when new equipment is added, or present equipment is replaced.

HANDLEVER COLLET ATTACHMENT
Permits releasing and feeding bar stock through the collet without stopping the lathe. Available with hardened ground steel collets, soft brass collets, or a combination of both. Write for Catalog No. 77 which shows all attachments.

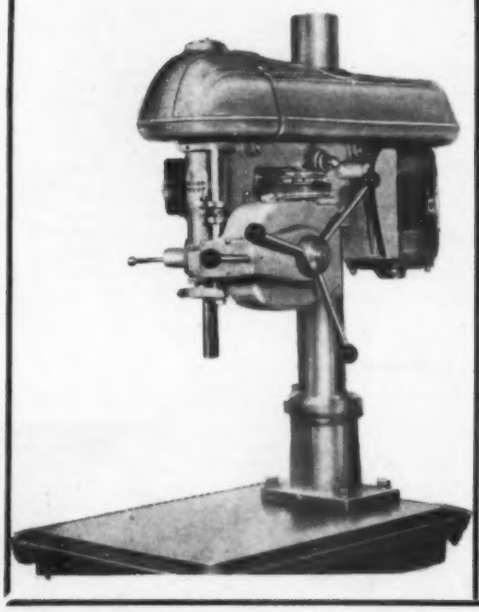


Machining to split-thousandth accuracy is easy with a 16-inch South Bend Precision Toolroom Lathe.

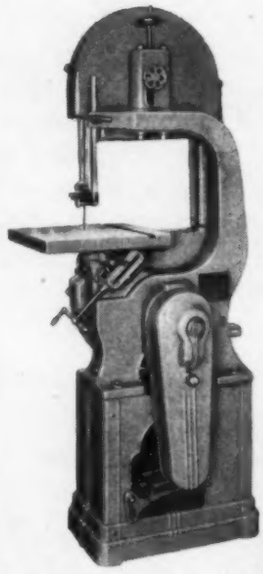
Send For This Catalog
Write for your copy of Catalog 100-D which shows in color all styles and sizes of South Bend Toolroom, Turret, and Engine Lathes. Made with 9", 10", 13", 14½", and 16" swings. Accessories and attachments also shown.

SOUTH BEND LATHE WORKS
LATHE BUILDERS SINCE 1906
419 EAST MADISON STREET SOUTH BEND 22, INDIANA

260-5200
R.P.M.



70-5300
S.P.M.



160-8200
R.P.M.

Get The *Correct* Cutting Speed
WITH WALKERTURNER MACHINE TOOLS!

Every material—every operation—has its proper speed . . . the speed at which machining is done most accurately, most economically, most efficiently.

Walker-Turner Machine Tools—because of their exceptionally wide ranges of cutting speeds—enable production men to hit the correct speed "on the button"! This gives Walker-Turner Machine Tools versatility for handling all materials in all types of operations . . . from every-day production to complicated, special tooling set-ups. These qualities may prove the answer to your own problems. *Write for our catalog today!*

WALKER-TURNER CO., INC., Plainfield, N. J.

Walker-Turner
Machine Tools Offer These Advantages:

- *Versatility*
- *Rugged construction*
- *Safe, simplified operation*
- *Low power consumption*
- *Low capital investment*
- *Low operating and maintenance cost*

RADIAL DRILL—Drills to center of 62" circle. Head tilts 45° right or left. Maximum distance nose of check to table, 13½". Spindle traverse, 3¾". Chuck capacity, ½".

METAL-CUTTING HAND SAW—14" and 16" models. Geared speed reducer. Table tilts to 45° and has mitre gauge groove. Blade tensioning device has spring cushions to absorb shocks.

20-INCH DRILL PRESS—Hand or power feed. Bench or floor, single or multi-spindle models. Drills to center of 20" circle. Feed 8". Capacity 1" in cast iron, ¾" in steels.

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

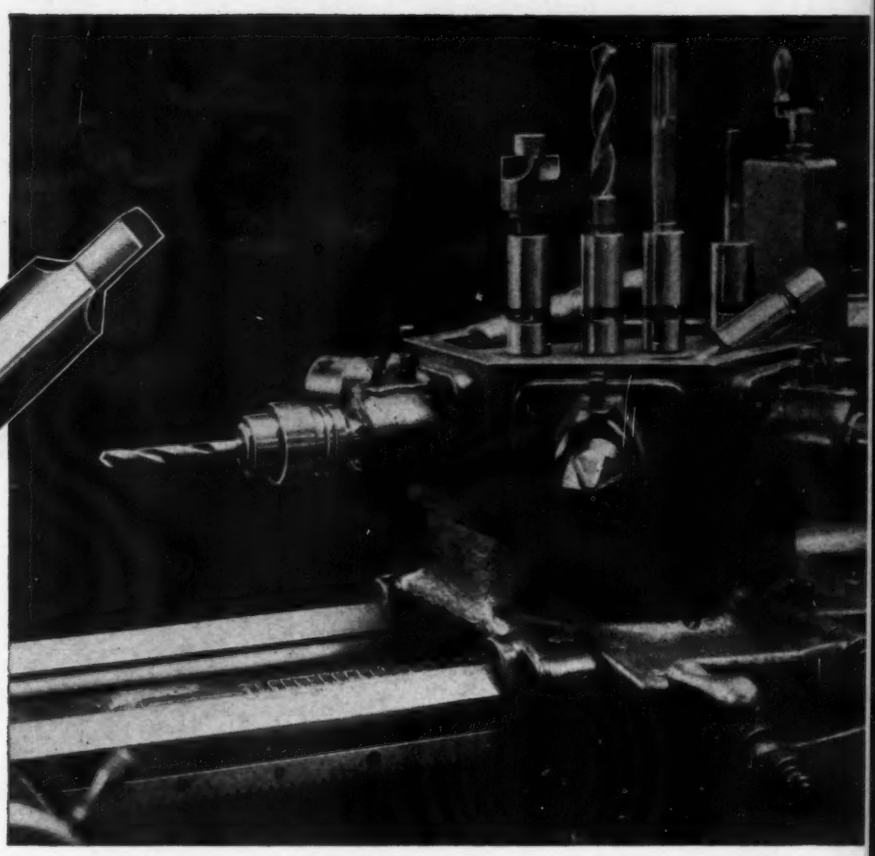
MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

. . . need extra turret lathe stations?

Make them available with

MODERN-MAGIC CHUCK and COLLET EQUIPMENT



Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern-Magic Quick Change Chuck and Collet Equipment has repeatedly proved its value to turret lathe operation where there are not enough openings in the turret to accommodate all the necessary tools for the job.

In effect, Modern-Magic Quick Change Chuck and Collet Equipment makes available as many extra turret stations as are needed. The tools being inserted and removed, one after the other, to take care of each extra operation.

With Modern-Magic Quick Change Chuck and Collet Equipment, tool changes are quickly and easily made. Production is stepped-up and cost reduced.

For complete information covering Modern-Magic Quick Change Chuck and Collet Equipment, send for Bulletin No. M-101

Prompt shipment from stock

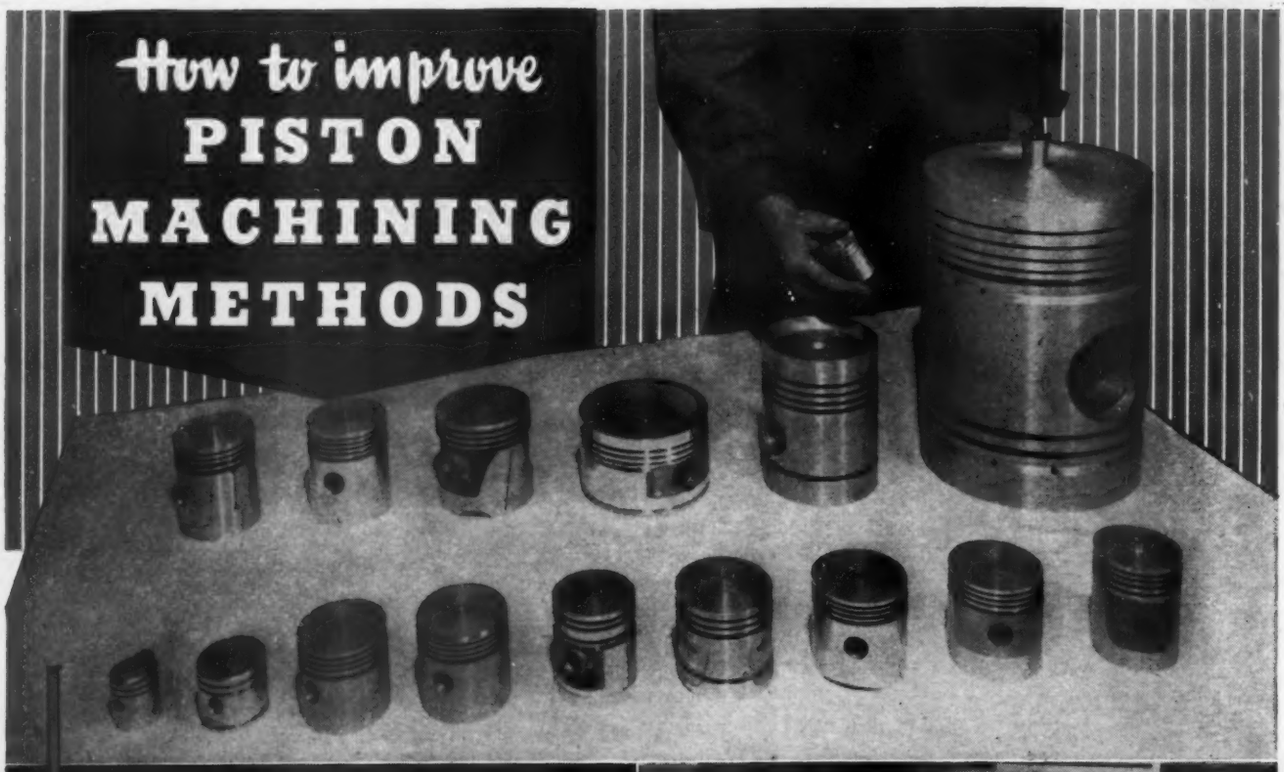
MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

How to improve PISTON MACHINING METHODS



with SUNDSTRAND "ENGINEERED" PRODUCTION

Although Sundstrand "Engineered" Production has been applied to all types of parts requiring diversified operations, it is interesting to see the results when applied to one specific type of different sizes and materials. These pistons range from the small compressor type to large Diesel engine pistons. Materials are cast iron, steel and aluminum.

Operations include turning, grooving, facing, boring, centering, milling skirt, slitting and an inspection cut after moulding. Three typical tooling operations are shown.

If you manufacture pistons for outboard motors, automobiles, tractors, motorcycles, airplanes, Diesels, compressors or replacement pistons, our engineers have had practical experience which may be of help to improve your machining methods. Call on them without obligation.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

RIGIDMILS | FLUID-SCREW RIGIDMILS | AUTOMATIC LATHES | HYDRAULIC EQUIPMENT

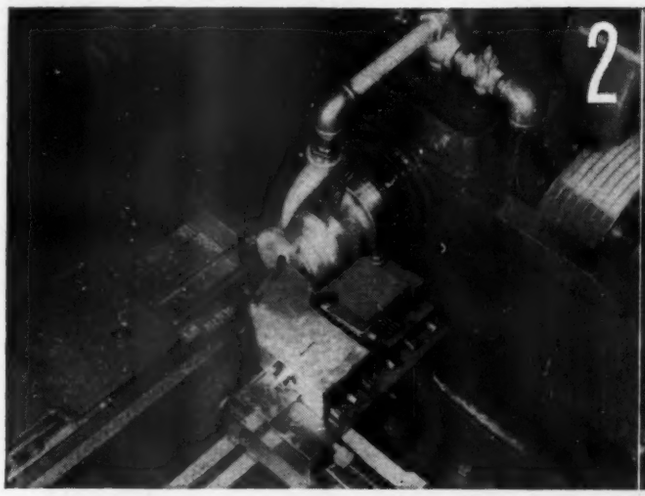
TYPICAL OPERATIONS

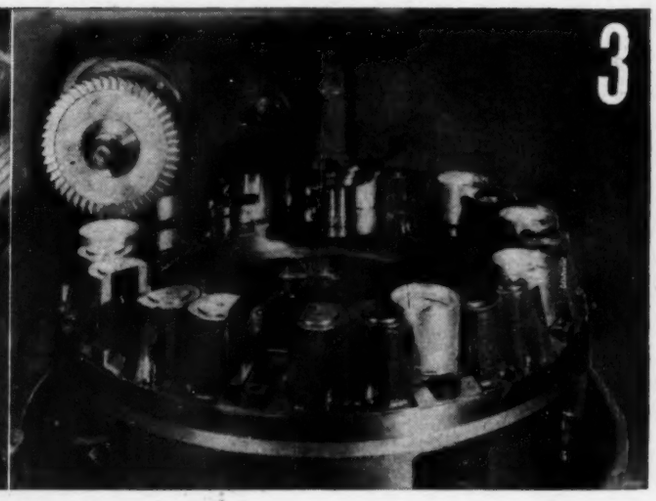
Sundstrand automatic lathes handle all turning, facing, boring, grooving and centering operations shown on the pistons. Sundstrand standard and special Rigidmils are used for various milling operations such as milling the skirt, slitting etc. Here are 3 typical examples of machining operations:

1 Finish turning the outside diameter while finish grooving and finish facing the contour on the head end of a Diesel engine piston.

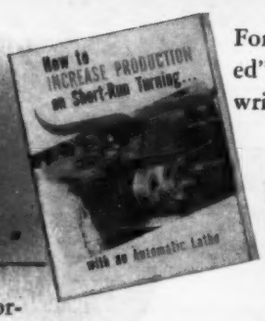
2 Turning the O. D. while grooving and facing the head of an aluminum piston. Machine used is a Sundstrand automatic lathe.

3 Sundstrand Rigidmil designed to mill the skirt and slit automotive pistons on a high production basis.





How to apply Sundstrand "Engineered" Production to your work . . . .



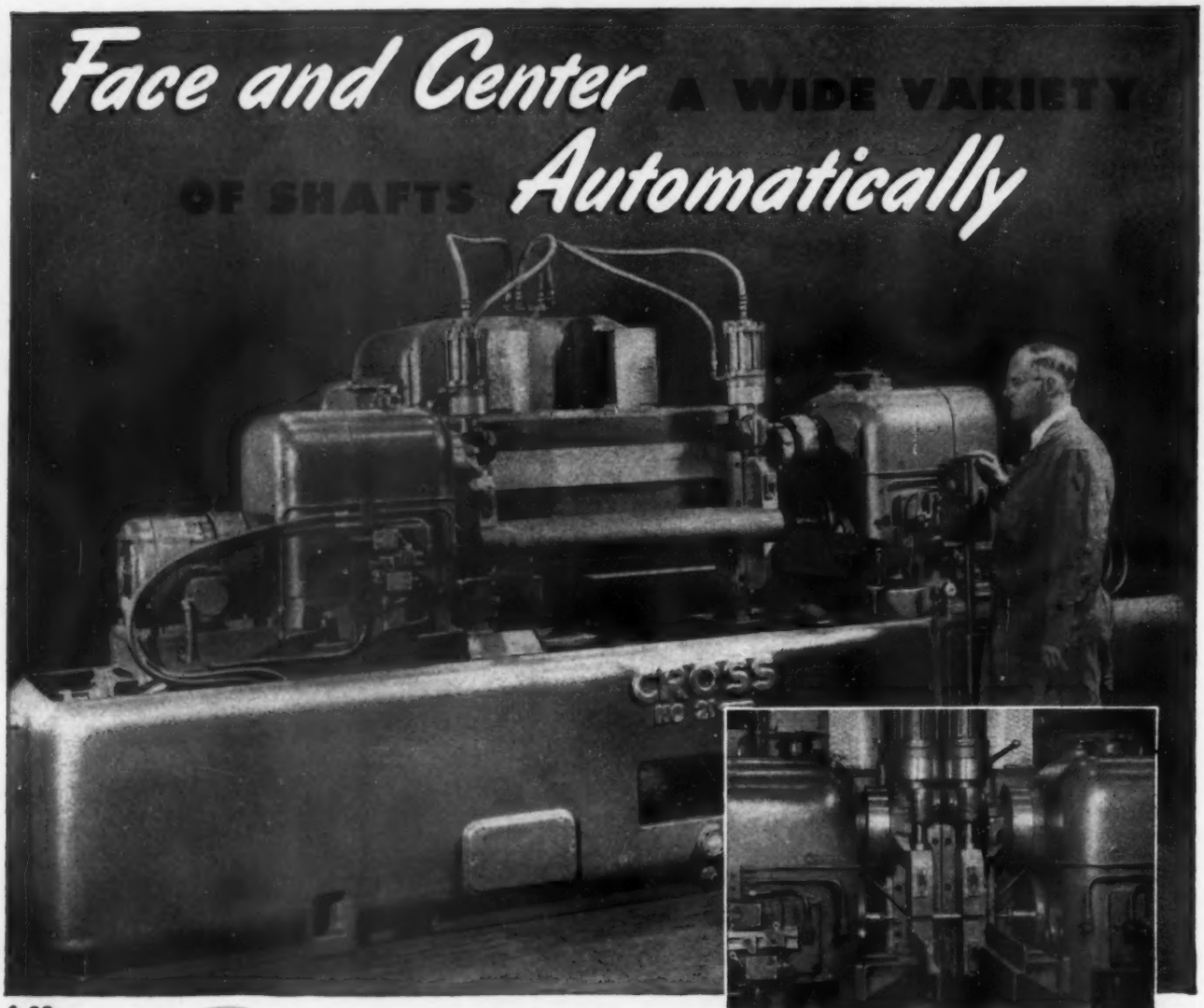
This booklet contains useful turning information on a wide variety of parts and materials. A study of these modern tooling methods may reveal profitable methods for you. Write for your copy today. Ask for bulletin No. 147.

For additional information on how Sundstrand "Engineered" Production has been applied to milling problems, write for our booklet "Practical Milling Methods."

SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES | **SPECIAL MILLING AND TURNING MACHINES**

Face and Center A WIDE VARIETY OF SHAFTS Automatically



S-30

Here is a new approach to the old problem of finishing and centering the ends of shafts for subsequent operations. Producing fifty average shafts an hour, man and machine hours have been greatly reduced by this Cross universal machine . . . In a full automatic cycle controlled by push button, the work feeds up to mill both ends; the carbide cutters retract and the work lowers for centering and unloading. In this new design both the work and the cutters are supported at the point of cut, eliminating all overhang. Change-over time from one size shaft to another is about ten minutes . . . For complete information write THE CROSS COMPANY, Detroit 7, Michigan. Dept. 221.

MACHINE TOOLS

CROSS

ESTABLISHED 1890

SPECIAL MACHINES

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

• Chicago • DETROIT • Cincinnati •

THE CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

U. S. Steel's Carnegie-Illinois has patented "Stainless W", a chrome nickel steel that can be heat-hardened.

get ready with CONE for tomorrow

"Homogenization", a familiar treatment for milk, is being tried by the Marco Co. of Wilmington for its effect on metal alloys, petroleum, rayon and chemicals.

get ready with CONE for tomorrow

General Motors' engineers state that diesel engines are now so refined that they are creating a demand for special fuels with specific properties.

get ready with CONE for tomorrow

Texas Industrial Co. of Houston, Texas, has developed a radial diesel aircraft engine, from government surplus, into a power plant capable of lighting a town with 300 population.

get ready with CONE for tomorrow

Glenn L. Martin Co. and U. S. Plywood have collaborated on a construction material in the form of a sandwich. The core is a honeycomb of impregnated cloth or paper and the surfaces are of aluminum, steel, wood or plastic.

get ready with CONE for tomorrow

A relay capable of speeds up to 1,000 operations per second has been developed by Stevens-Arnold.

get ready with CONE for tomorrow

Measuring 9 inches in diameter, a new hydraulic pump made by Hydraulic Machinery Co. of Detroit is said to develop 5,000 lbs. per square inch pressure.

get ready with CONE for tomorrow

B. F. Goodrich has broken ground for a new research laboratory on a 260-acre tract between Akron and Cleveland.

DuPont reports the development of porcelain enameling on aluminum castings.

get ready with CONE for tomorrow

The world's largest concrete dam and hydro-electric plant will be built by the Chinese on the Yangtse River.

get ready with CONE for tomorrow

Victor Division of RCA is using electronic heating to seal in the metal contacts in cathode ray tubes.

get ready with CONE for tomorrow

The new Crosley automobile engine is built largely of sheet steel stampings and develops 26 h.p. with a weight of only 59 lbs.

The City of New Orleans proposes to expedite its future traffic by building a tunnel under the Mississippi.

get ready with CONE for tomorrow

The "Quantometer" is made to analyze the amounts of each element in an alloy automatically and at production-line speed. It has been developed by the Applied Research Laboratories of Glendale, California.

get ready with CONE for tomorrow

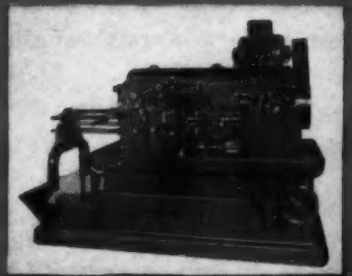
A new Westinghouse device is said to snap an X-ray picture in a millionth of a second showing imperfections in parts under stress at high speed.

get ready with CONE for tomorrow

Peninsular Chemical Products Co. of Van Dyke, Michigan, has a new odorless, quick-drying maintenance paint that is proof against acids, alkalis and water and may be applied to wet, porous or heated surfaces.

Extra facility is extra value

This brass compression nut from 7/16" hex stock, a job ordinarily assigned to lighter duty machines, was produced by a rugged ⅞" 4-Spindle Conomatic at the rate of 4 seconds each—fifteen per minute.



Write to Cone for particulars.

Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

28

FOR WORK UNIFORMS THAT STEP UP EFFICIENCY—*DEMAND*

REEVES ARMY TWILL

"FROM COTTON TO CUTTER"

Now you can specify durable, smart looking Reeves Army Twill for uniforms and work clothes. Its high tensile strength insures rugged wearability. It tailors smartly, too, and is color-fast to sun, water and perspiration. Sanforized Shrunk*, it is the fabric for long-lasting economy. Remember—over 90 million yards of this same fabric helped equip America's fighting men—exceeding Government specifications under the toughest climatic and combat conditions.

**Residual shrinkage less than 1%*

THE REEVES FABRIC GROUP INCLUDES: *Reeves Army Twill • Glengarrie Poplin • Reeveking Gabardine • Byrd Cloth • Marine Herringbone • Mountain Cloth • Warrior Twill*

SPINNING WEAVING DYEING FINISHING Reeves FABRIC

REEVES BROTHERS, INC.

54 WORTH STREET • NEW YORK 13, N. Y.

Mills Mill, Greenville, S. C. and Woodruff, S. C.
Fairforest Finishing Co., Spartanburg, S. C.

Representatives in Atlanta • Boston • Chicago • Dallas • Los Angeles • Philadelphia • St. Louis • Montreal • Toronto

Latest Monarch Lathe Development Uses

20 TIMKEN BEARINGS

Designed to do work that heretofore has necessitated considerable special engineering — and to do it quickly, accurately and easily — the Monarch Moldmaker's Toolroom Lathe is the latest addition to the Monarch line.

Briefly, this machine solves the problem of shrinkage in making molds for producing accurate threaded parts for the plastics, molded rubber goods, powdered metal and porcelain industries, where the threads in the mold must have a longer lead than those in the finished parts.

It eliminates the necessity of making special change gears for each different type of mold. A lead screw varying mechanism — an inherent part of the lathe — makes it possible for the regular quick change gear box to be used for all lead screw variations. Thus the machine can quickly be set from one job to another.

Twenty Timken Tapered Roller Bearings applied throughout the lathe — including the mounting of the main spindle — help to assure the necessary precision, speed and endurance. You can have the bearing performance so long enjoyed by The Monarch Machine Tool Company by making sure that the trade-mark "TIMKEN" appears on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

New Tempering Attachment Gives

STRONGER WELDS IN AIR-HARDENABLE STEEL

Ladder sections are welded on this specially designed welding machine, which is suspended from an overhead monorail and moves the length of the ladder side rail.

● Fire-fighting ladders of low-alloy steel are now being spot-welded by a new method at the American-La France-Foamite Corporation, Elmira, N. Y. The welding machines are equipped with G-E synchronous electronic control and a new G-E tempering attachment.

HEAT TREATING ELIMINATES BRITTLENESS

To meet exacting strength requirements, these lightweight ladders must have tough, ductile welds. Such welds cannot be made in air-hardenable steel by normal methods because chilling effects of the water-cooled electrodes would cause the weld nugget to be brittle. And the weld, as a result, would be weak.

Use of the tempering attachment, by which the work is heat treated without removing it from the welding machine, makes possible consistently strong welds.

HOW IT'S DONE

The weld is made in the normal manner. When its temperature has dropped to approximately 200 to 300 degrees above room temperature, current is passed through again. Adjustment of this current, which differs in both time and magnitude from that used in the welding, is provided by the tempering attachment.

The additional heating, or tempering, materially increases the toughness and ductility of the weld.

FOR ADDITIONAL FACTS

Wherever medium-carbon, low-alloy, or high-alloy steels must be joined, spot welders with G-E tempering control will give a product of maximum strength. For further details about this control, get in touch with your resistance-welder manufacturer or our nearest office. Ask for our Bulletin GEA-4201. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

● ● ●

In this strength test, the American-La France-Foamite 100-foot, all-steel fire-fighting ladder supports weights totalling 3,200 pounds at an angle of 60 degrees.

● ● ●

● ● ●

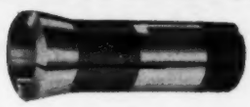
RESISTANCE WELDING CONTROL

GENERAL ELECTRIC

STAMINA

the Wade No. 8A toolmakers' lathe . . .

has such features as . . .



1. A spindle supported by an SKF double row cylindrical roller bearing plus two heavy duty precision roller bearings, all preloaded.
2. Especially designed collets, tools, and attachments to insure enduring accuracy and long life.
3. Rugged, exact construction throughout every part and every assembly.

which result in . . .

1. A spindle of greater rigidity permitting heavier cuts, smoother finishes, greater accuracy, and increased production.
2. Longer precision ground collet bearing surfaces that assure true running throughout a long life—a greater range of regular turning operations plus grinding and the turning of odd shapes.
3. An ability to turn out tools and parts with a degree of precision not usually possible in larger, or smaller, machine tools.

These advantages, plus twelve spindle speeds from 35–2000 R.P.M., lead screw accuracy of ± .0005 per foot of lead, a unique, quick-operated, belt-shifting mechanism—and extremely sensitive control all add up to make the Wade No. 8A Toolmakers' Precision lathe a highly productive, extremely accurate machine tool with an exceptional stamina that means extra years of profitable operation.

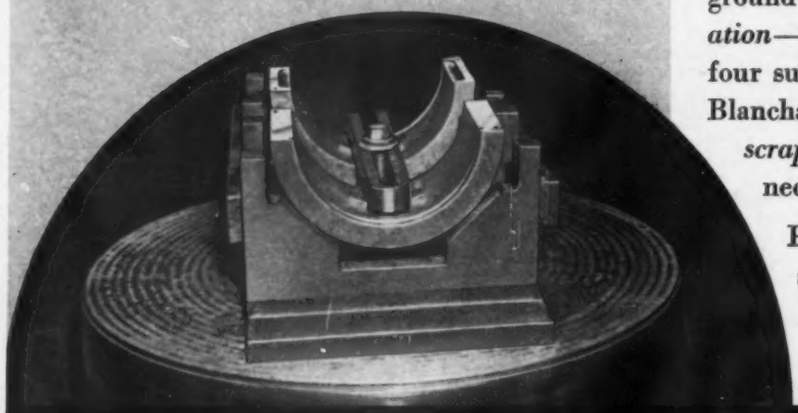
Wade

The Wade Tool Co.
53 RIVER ST.
WALTHAM 54, MASS.

THE WADE TOOL CO.
53 River Street
Waltham 54, Mass.
Please send me without obligation your Catalog giving complete details on the Wade No. 8A Toolmakers' Lathe.

Name_____ Title_____
Company_____
Street_____
City_____ State_____

"Put it on the Blanchard"



GRINDING HALVES of TURBINE BEARING

Material: steel and bearing babbit

Size (assembled): 12⅞" O.D., 9⅛" I.D., 7⅝" LG.

Held in an inexpensive fixture on the magnetic chuck of a No. 18 Blanchard Surface Grinder, *both halves* of the turbine bearing are finish-ground at the parting joint *in the same operation*—1/64" is removed from each of the four surfaces. The flatness and finish of the Blanchard-ground surfaces are such that *no scraping* or other means of correction is necessary to provide *oil-tight joints.*

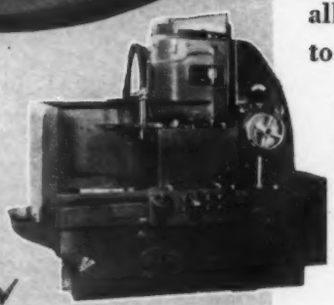
Production is 4 pairs or 8 halves (16 surfaces) per hour. This includes loading and unloading the pieces in the fixture.

The bearing halves are then assembled and held together in a simple clamping fixture. Returned to the Blanchard—*no machine changes are necessary*—both ends of the assembled turbine bearing are finish-ground. (1/64" is removed from each end.) The Blanchard-ground end surfaces are *flat and parallel*, allowing the subsequent finish-boring operation to be registered from either of them.

Production is 8 half bearings (16 surfaces) per hour, which includes assembly and clamping time.

Get These Advantages...

PRODUCTION ✓
ADAPTABILITY ✓
FIXTURE SAVING
OPERATION SAVING ✓
MATERIAL SAVING
CLOSE LIMITS
FINE FINISH ✓
FLATNESS ✓



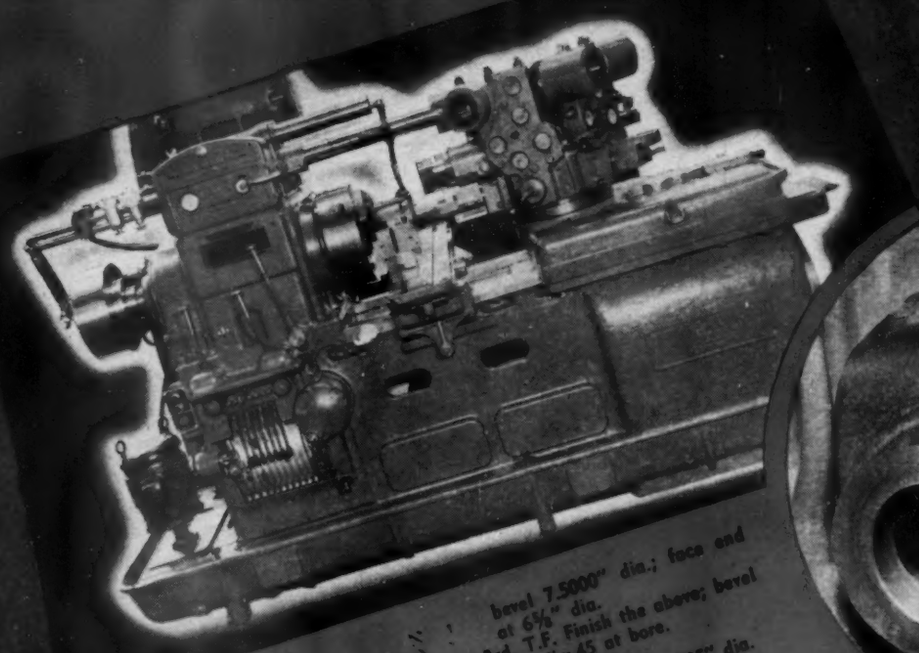
Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Tooled for the job... this P&J AUTOMATIC

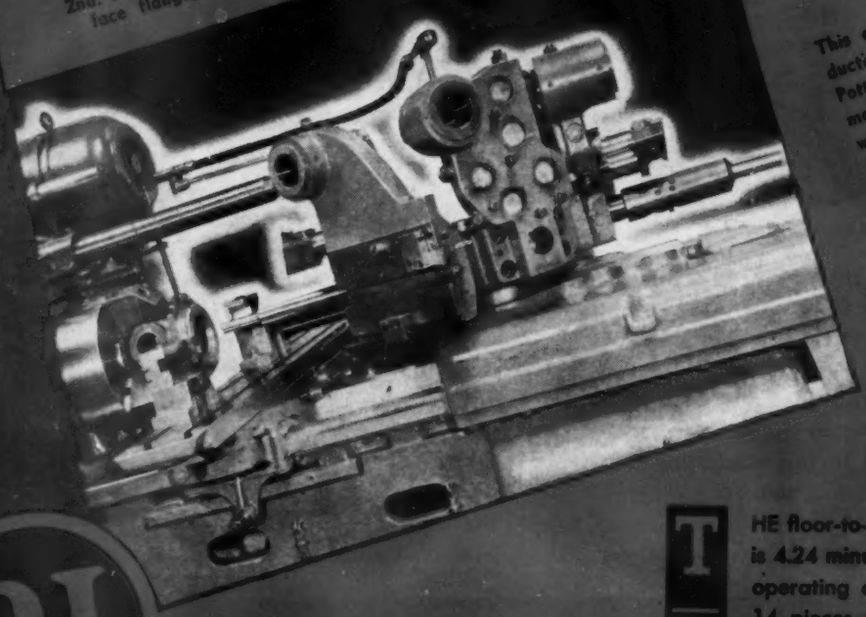
PRODUCES 14 PIECES PER HOUR



Part: Bevel Gear Case
Material: Grey Iron
Operation:
1st. T.F. Blank
2nd. T.F. Rough bore 4.626" dia.; face flange; rough turn end bevel 7.5000" dia.; face end at 6⅝" dia.
3rd. T.F. Finish the above; bevel 1/16" x 45 at bore.
4th. T.F. Blank
5th. T.F. Size bore 4.625" dia.
6th. T.F. Size turn 7.500" dia.

TAILS OF JOB

This example of high production is typical of the way Potter & Johnston Automatics save time and money with tools designed for the job. Furthermore, the power and stamina inherent in these machines are more than sufficient to permit fast cutting speeds with tungsten carbide tools and maintain accuracy.



THE floor-to-floor time for the job shown here is 4.24 minutes per piece. With the machine operating at 100% efficiency production is 14 pieces per hour. At 85% machine efficiency, 12 pieces per hour is the average output. Performance such as this is not exceptional but is actually planned for in the tooling. Operative convenience is such that on a set up such as the one shown here, one operator can easily handle a battery of these machines.

A time and cost estimate of producing your parts on P&J Automatics will be made by our engineers if you will give us details of any job you have in mind.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I.

MORE STARTS FOR THE 1946 STUDEBAKER

G-E electronic heater adds life . . . cuts production time of automobile starter ring gears

G-E 50 kw electronic heater, used at Studebaker's South Bend plant

HEAT-TREATING time has been reduced and the gears have been tested to withstand four times the number of starts expected in the normal life of the car.

It used to take 2½ hours to heat and temper these gears—now it can be done in 20 seconds, and the entire process is completed in the machining department—in proper manufacturing sequence.

Induction hardening, with the electronic heater, is eliminating costly, time-consuming operations in many plants. Since only the teeth are hardened and then quenched in a matter of seconds, distortion is reduced to a minimum.

The General Electric Company is anxious to give you the benefit of more than 20 years experience in industrial heating. Brazing, soldering, annealing, hardening—let our heating specialists give you an unbiased recommendation on the best type of heating equipment for your job. As manufacturers of furnaces as well as electronic heaters, G.E. can supply the equipment best-suited to your needs. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

Particularly for Planners

...by UNION

The men who plan production have found that Union Tools fulfill their most exacting specifications for precision—plus productivity. Union Tools are designed particularly for these exacting planners . . . made to make it easier for them to stick to their schedule of production and maintain their standards of accuracy.

UNION TWIST DRILL CO.
ATHOL MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec

STORES:

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 5527 Woodward Ave.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

Increased production facilities enable Card to make prompt Deliveries in all sizes and types. Exceptionally high quality uniformly maintained, and unquestioned accuracy make these Tools profitable equipment in the shops where sustained production is the difference between profit and loss.

UNION ★ BUTTERFIELD ★ CARD

THE STANDARD FOR PRODUCTION

BUTTERFIELDS!

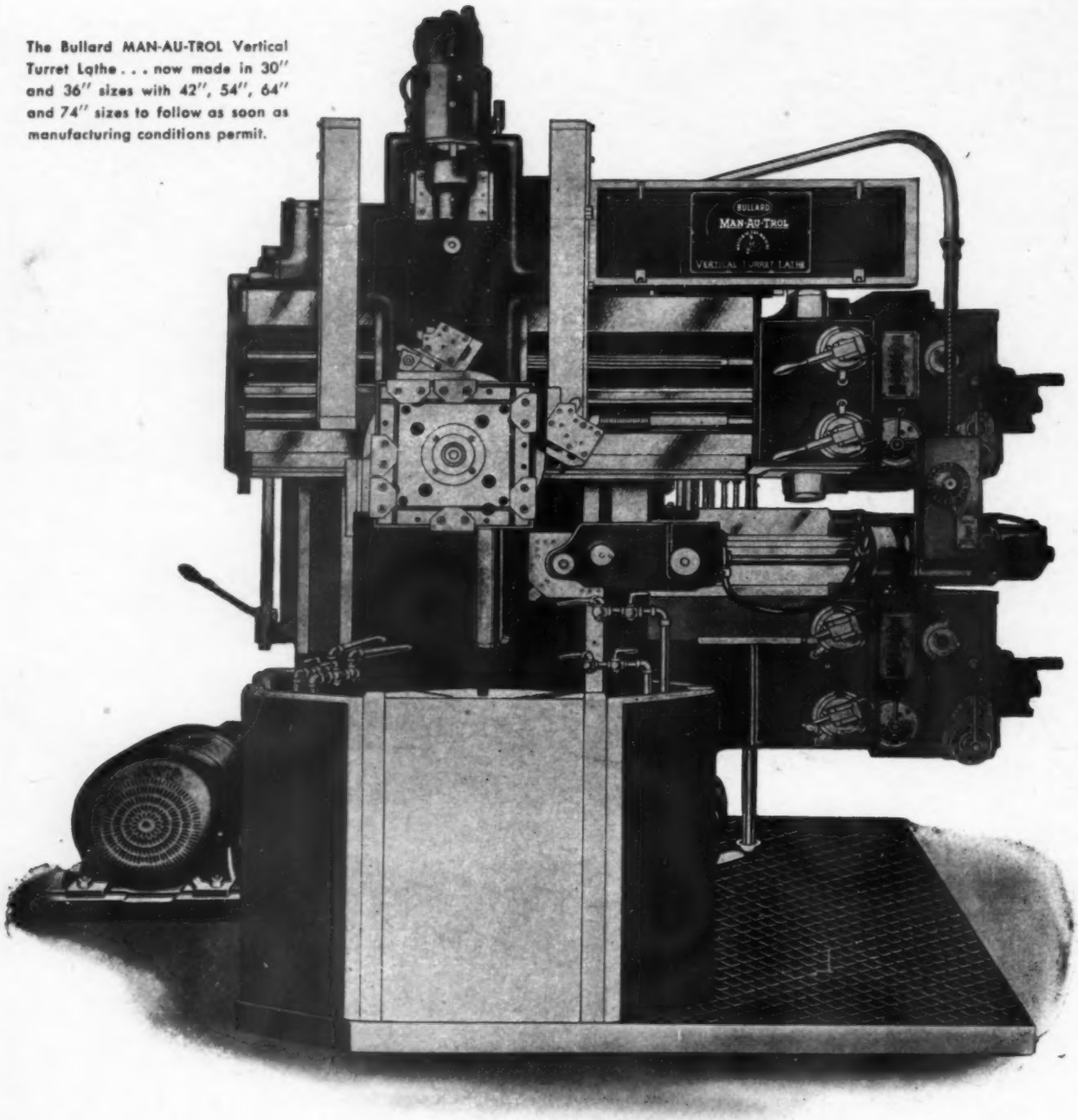
BUTTERFIELD DIVISION
Derby Line, Vt., Rock Island, Que.

Butterfield conventional Pipe Taps. Inserted Chaser Pipe Taps. Mud Plug Taps—their line is complete as to range of sizes . . . each Tap producing long runs of high quality accurate threads under heavy duty conditions. Specify "Butterfields" — the standard for production—to get maximum service!

STORES: New York, 61 Reade St.—Chicago, 11 So. Clinton St.—Cleveland, Hal. W. Reynolds, 3346 Superior Ave.—Detroit, 5527 Woodward Ave.—Los Angeles, 524 E. Fourth St.—Toronto, 137 Wellington St., West—Montreal, 111 St. Paul St., West—Winnipeg, 403 Travellers Bldg.—Vancouver, 327 Shelly Bldg. Agents for Great Britain: Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S.E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

Divisions of the Union Twist Drill Company

The Bullard MAN-AU-TROL Vertical Turret Lathe . . . now made in 30" and 36" sizes with 42", 54", 64" and 74" sizes to follow as soon as manufacturing conditions permit.



How short a run can an automatic machine handle efficiently?

NOW . . . one piece or thousands!

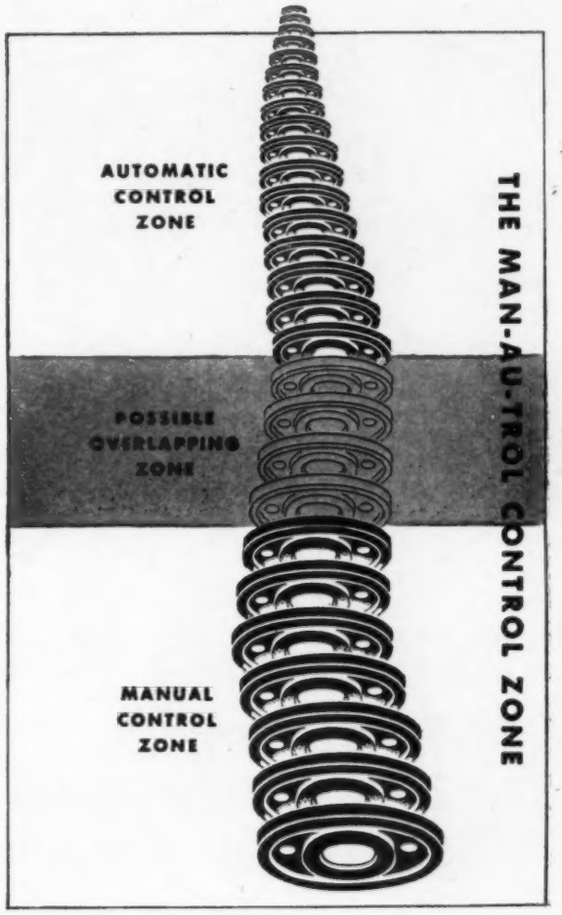
BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

BULLARD CREATES *NEW METHODS*

The reason is...

BULLARD MAN-AU-TROL

The automatic control that is as versatile as manual control



Now an automatic machine can be kept busy on short or long runs if it's a Bullard MAN-AU-TROL machine.

The Bullard MAN-AU-TROL principle of automaticity makes *one* machine *both* an automatic machine and a manually-controlled machine. On short runs, you can operate it manually. On longer runs . . . about 10 or more pieces . . . you can set it up quickly and easily for 100% automatic operation.

Such unique versatility provides greater efficiency for diversified shop schedules . . . lower unit costs to meet modern economic needs.

At present, MAN-AU-TROL is being built into Bullard machines only.

The proof is...

BULLARD MAN-AU-TROL *Vertical Turret Lathe*

See how the Bullard MAN-AU-TROL Vertical Turret Lathe solves production problems that are on your mind these days:

1. Lightens Labor's Load because the operator machines the first piece under manual control while easily setting the operations for automatic cycle . . . then merely loads, supervises and unloads when MAN-AU-TROL's 100% automaticity takes over.

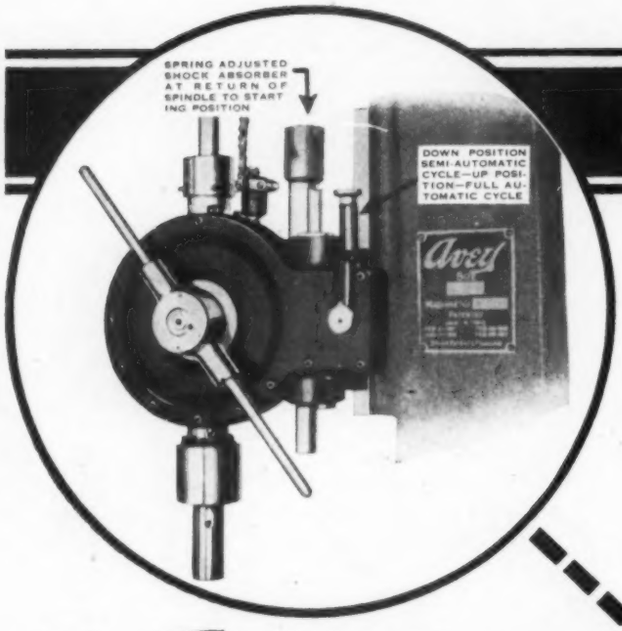
2. Makes One Machine Do More because it automatically machines any class of work within manual-control range . . . is instantly convertible to manual operation on the same or a different piece without affecting the automatic cycle.

3. Cuts Automatic Set-Up Time because set-up time from one class of work to another is only slightly more than for a manually-operated machine.

4. Reduces Spoilage because it operates continuously to a degree of accuracy no manual operator can duplicate.

Engineering data and other facts on the Bullard MAN-AU-TROL Vertical Turret Lathe are yours for the asking. Write for Bulletin MAV-G-1 today. The Bullard Company, Bridgeport 2, Connecticut.

TO MAKE MACHINES DO MORE


SPRING ADJUSTED SHOCK ABSORBER AT RETURN OF SPINDLE TO START ING POSITION
DOWN POSITION SEMI-AUTOMATIC CYCLE—UP POSITION—FULL AUTOMATIC CYCLE
Avey

Avey FEATURE No. 4

THE Avey TYPE MA-6

AVEY-MATIC POWER FEED HAND FEED AND REVERSING MOTOR TAPPING MACHINE

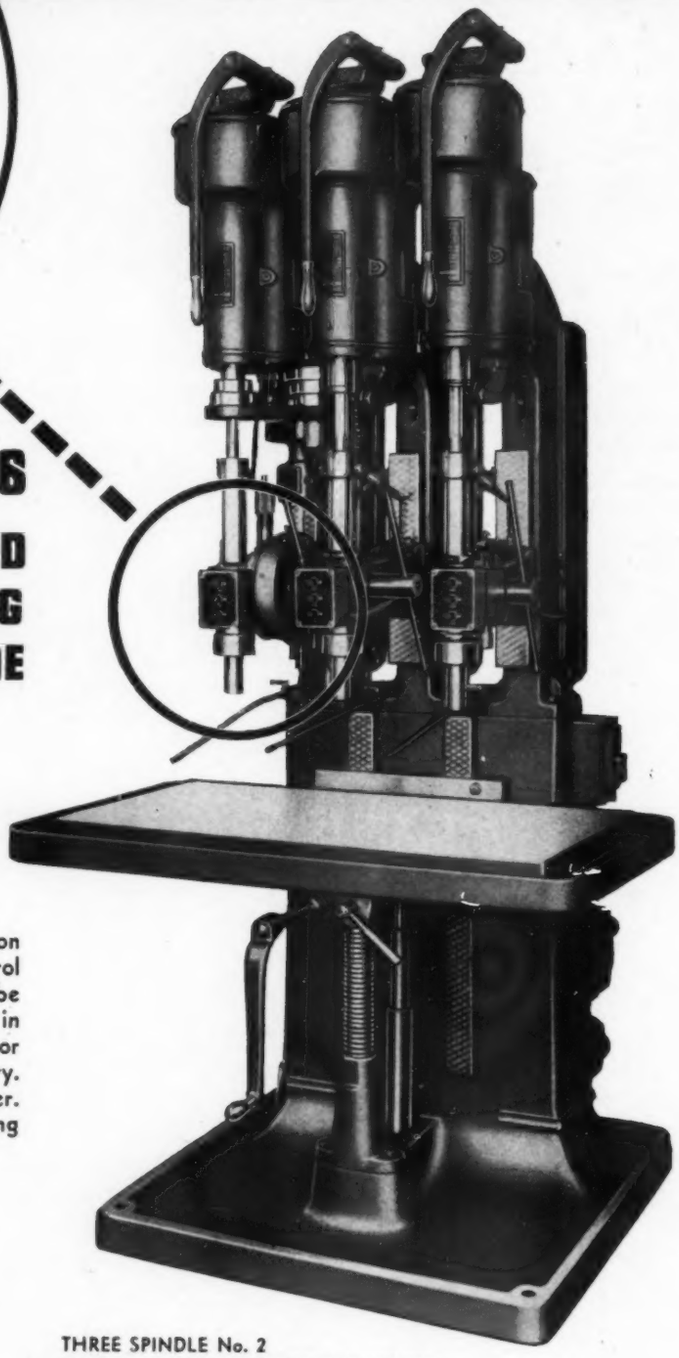
features

single lever control for automatic or manual operation

Single lever control — feed engaged with forward motion of feed lever. Automatic disengagement by dog control or by single hand lever. AVEY automatic feed may be applied to any or all spindles. Worm and worm wheel in constant enagement, running in oil. No friction shoes or dogs that require replacement. No adjustment necessary. Quick advance or over-running feed by hand feed lever. Can be arranged for full automatic cycle by changing position of handle at rear of unit.

Type MA-6 is made in following capacities:
No. 2 — 7/8" capacity in cast iron.
No. 3 — 1 1/4" capacity in cast iron.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.



THREE SPINDLE No. 2
TYPE MA-6 • COMBINATION MACHINE
1st Spindle - Avey-matic Feed
2nd Spindle - Hand Feed
3rd Spindle - Tapping (Reversing Motor)

This 12,500% increase *sounds fantastic!*

But True!

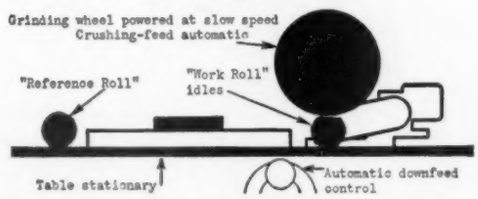
One of the major drawbacks to crush form grinding precision flat form contours has been the inability to produce on a practical production basis. This obstacle has been eliminated in two ways by the new Thompson Truforming Process.

First: Truform Grinders are engineered and built as a single unit, eliminating the failures of make-shift crushing arrangements and attachments.

Second: TWO CRUSHING ROLLS ARE USED. This is a major advancement, because it greatly extends crushing roll life and makes possible, for the first time, quantity production without constantly disturbing the set-up to re-process the crushing roll.

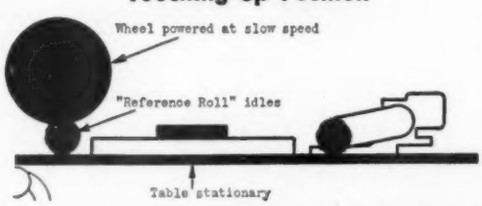
How two rolls operate in the Truforming Process is briefly illustrated and described below. The normal crushing or truing position is shown first.

Normal Crushing Position
Also Truing or Dressing



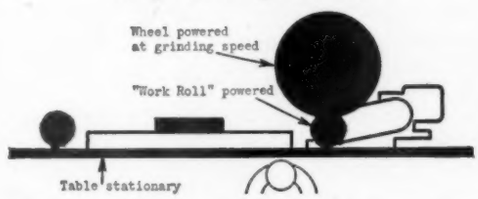
This is the position for the initial crushing of the wheel—and for subsequent truing or dressings when production grinding. On an eight pitch modified buttress thread form, 125 dressings were provided by the "work roll" before losing form.

Touching-up Position



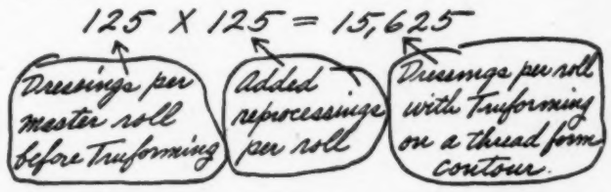
When the "work roll" loses form the table is moved to bring the grinding wheel over the "reference roll" for touching up, as shown above.

Re-processing Position



Because both rolls are table mounted, are in perfect alignment, and can be brought in the same relation to the grinding wheel, the original degree of accuracy can be quickly transferred from the "reference roll" back into the grinding wheel . . . and then ground back into the "work roll" as shown above.

The machine is then ready for production grinding again without disturbing the set-up or removing anything from the machine. In this way the "work roll" can be re-processed whenever it loses form and can be used for hundreds of additional dressings, or until it is worn out. Duplicate crushing rolls can be ground in the same way on all Thompson Truform Grinders.

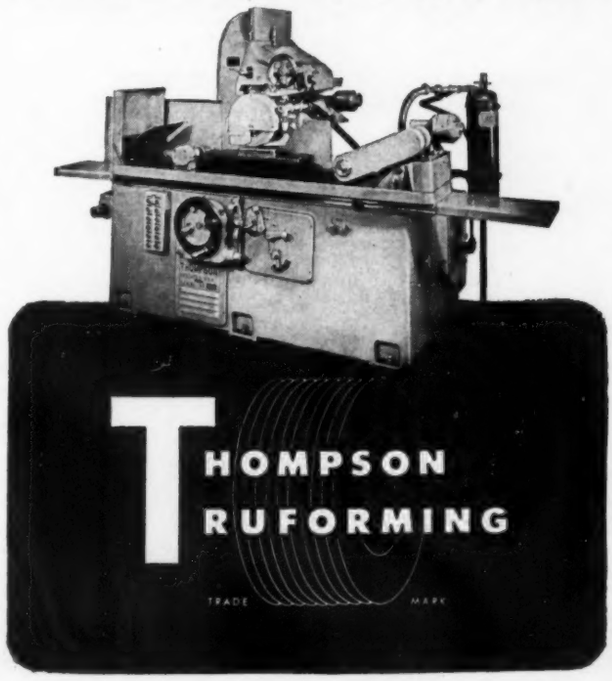

125 X 125 = 15,625
Dressings per master roll before Truforming
Added reprocessings per roll
Dressings per roll with Truforming on a thread form contour.

What this means in savings is illustrated by the following example, involving a modified buttress thread form with an eight pitch form. Where two rolls are used in the Thompson Truform Process, it was possible to get *over 15,625 dressings* from the "work roll" before it was worn out. This meant an increase in continuous production (without changing or disturbing set-up) of 12,500%.

Write for the new 8-page Truform Leaflet—"Why didn't you tell me about this process before?"

Address Dept. 16

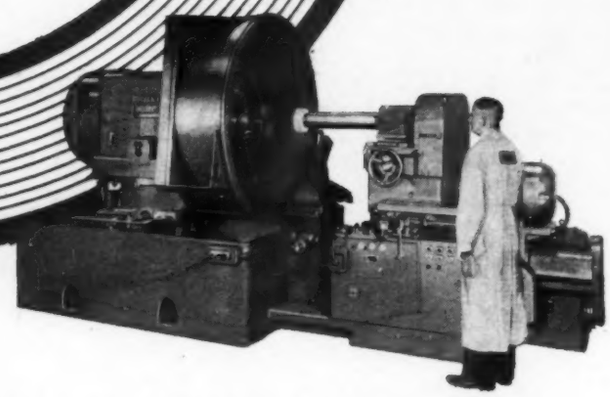
The Thompson Grinder Company • Springfield, Ohio



ANNOUNCING THE NEW No. 150

HYDRAULIC INTERNAL GRINDER

60" MAX. WORK DIA.



Another Bryant Postwar Development

The NEW Bryant No. 150 is a giant "internal grinder" with typical Bryant "fingertip" control. It retains the famous Bryant feature of three-point wheel slide suspension which is the basis of Bryant's reputation for high production of accurate work with fine finish.

The NEW Bryant No. 150 has a preloaded anti-friction cross slide, assuring smooth cross feed operation in spite of the size of the machine. Both hand and power cross feed are available and in addition, a hydraulic cylinder slides the wheel spindle to the rear to provide ample access for work loading or checking.

The work spindle is bored out to accommodate spindles or other long work which may be chucked conveniently by extension through the work spindle. The work spindle is designed so that chucks or fixtures may be mounted on either or both ends.

The NEW Bryant No. 150 will handle bore or bore & face grinding in a single chucking, and bores may be either straight or tapered. Write for a copy of the new catalog sheet which gives full details, capacities and dimensions.

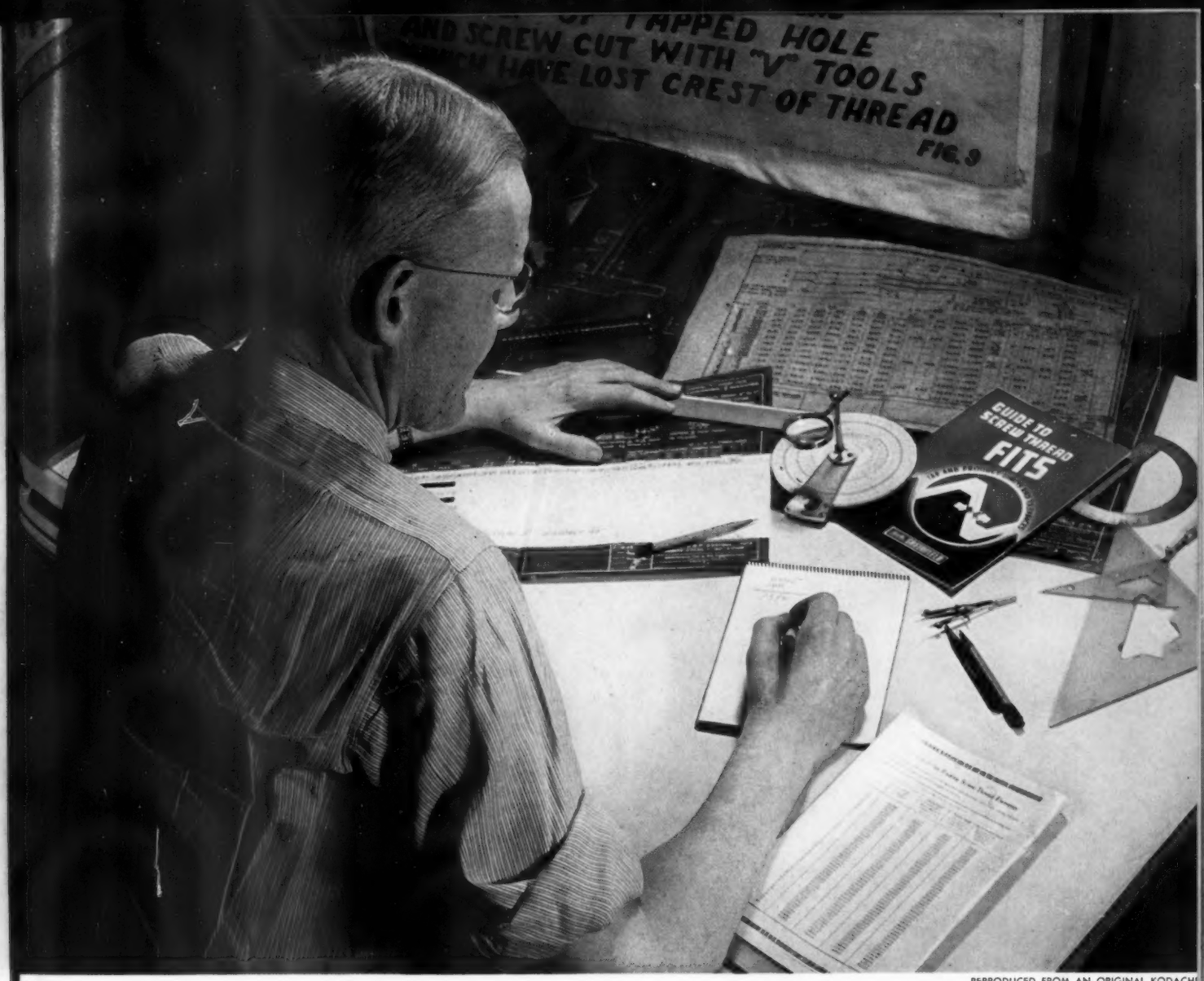
If your internal grinding work comes within the range of 1/16 inch diameter bore up to 60" diameter swing, it will pay you to

Send for the Man from Bryant!

BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.



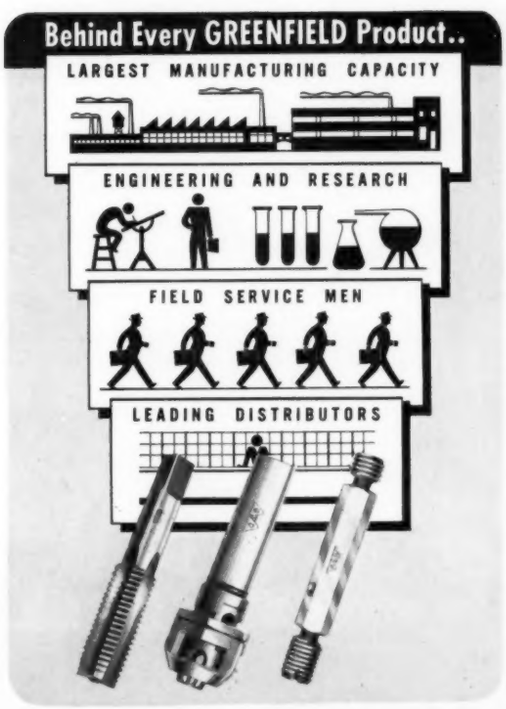
REPRODUCED FROM AN ORIGINAL KODACHI

Your Threading GHQ

When the man in charge of "operations" runs into a new problem, he usually looks to "General Headquarters" for help.

So in threading operations on all industrial fronts, the man with a problem is able to go to the engineering department of the Greenfield Tap and Die Corporation for expert help. "Greenfield" engineers can focus on any problem the cumulative "know-how" of years of pioneering leadership in screw thread research.

Not only does "Greenfield's" threading "GHQ" help solve specific day-to-day problems for users of threading tools, but it also carries on an intensive continuing program of research that benefits all users. *If you have a threading problem, get in touch with "Greenfield" screw thread engineers through your "Greenfield" distributor.*



GREENFIELD

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS

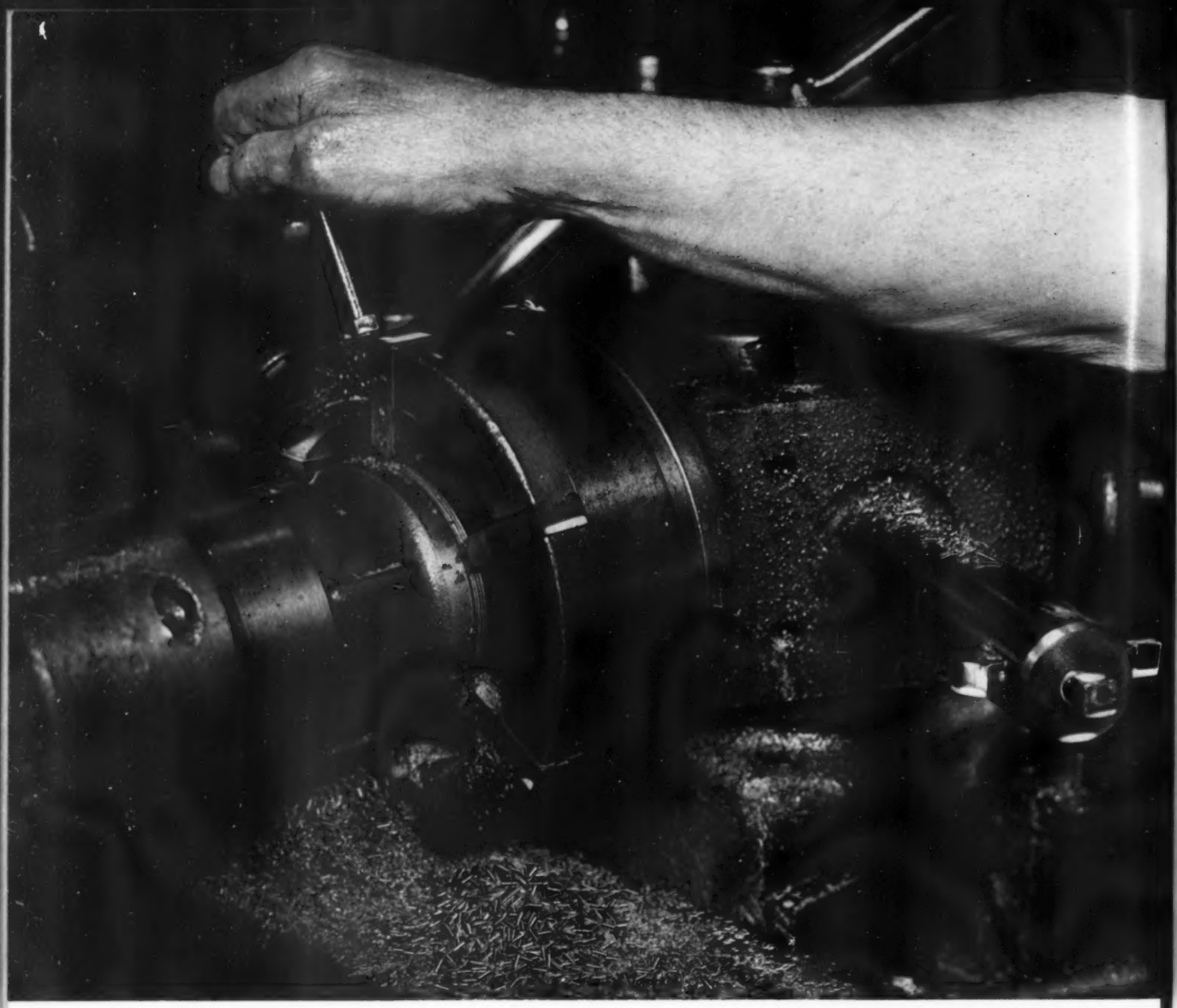
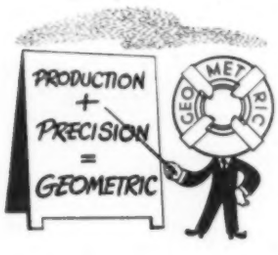


PHOTO COURTESY MANNING, MAXWELL and MOORE, INC., BRIDGEPORT

Production plus precision . . . that's GEOMETRIC!

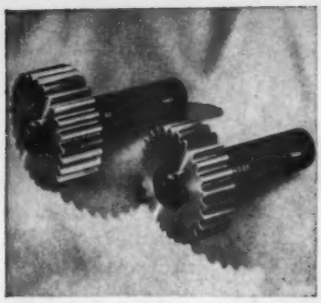


Threading the base of a safety valve is the kind of job that a Geometric Self-Opening Die Head (Style C) does with efficiency day in and day out. No fussing. No babying. When the machine operator tools up with a Geometric he knows he'll get clean, accurate threads. He knows, too, that he'll get production. That's why Geometric Self-Opening Die Heads and Collapsing Taps are known and respected in leading metal-working plants the world over for their simplicity, ruggedness and accuracy.

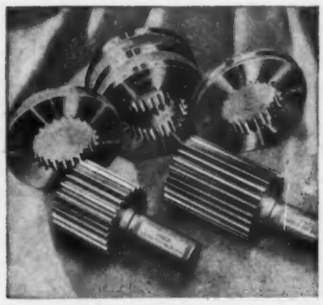
FOR NEARLY EVERY THREADING JOB — A GEOMETRIC!

If you have in mind a particular threading problem, we will be glad to have our engineers give you their recommendations, based on over a half century of specialization in this field. Why not let us send you the latest Geometric catalog?

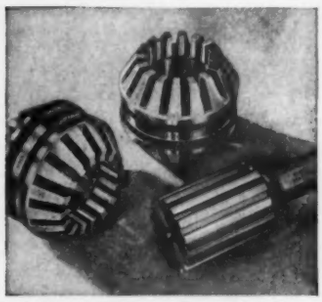
THE
GEOMETRIC
TOOL COMPANY . . NEW HAVEN 15, CONN.
A Division of Greenfield Tap and Die Corporation



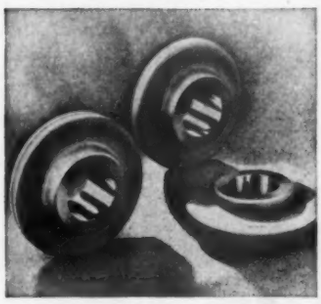
Over 50% of involute spline gages used are made by Vinco.



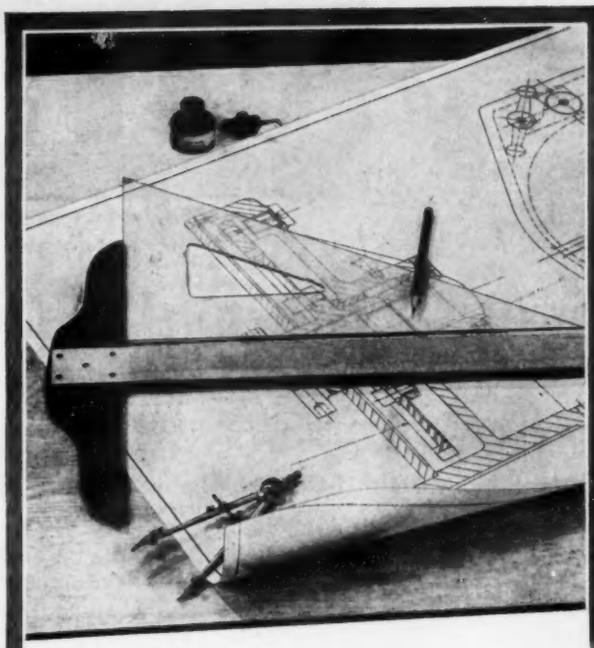
Vinco Serration Gages—standard of quality in accuracy and finish.



Accurate in every minute detail—Vinco Straight Sided Spline Gages.



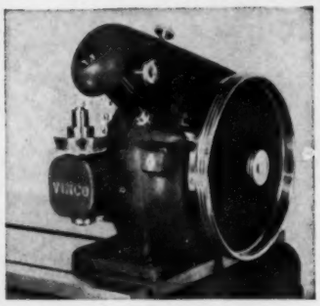
Longer life of gaging accuracy—Vinco Plain Plug and Ring Gages.



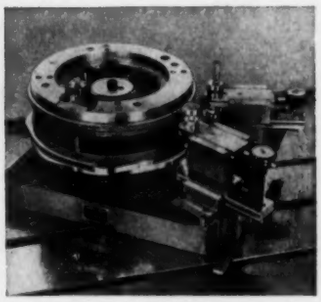
Let us take it from here on

The design may require close gaging—it could be a precision part to be subcontracted—it might need special jigs and fixtures to produce it. Whatever is required, call VINCO!

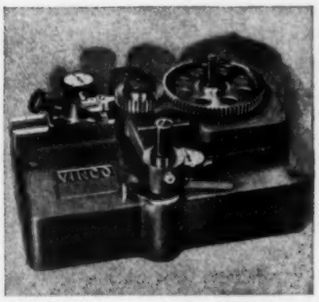
Twenty-five years of pioneering and perfecting methods of operation enables VINCO to manufacture precision products of the highest uniform quality—your assurance that any VINCO product or service will meet all specifications and conform to your particular needs. On any question of gaging, inspection control or precision production call VINCO first—it may save you both time and costly trouble.



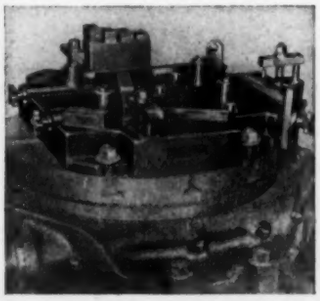
The Vinco Dividing Head—accurate checking of angular spacing.



Built-up and Special Gages—Vinco precision throughout.



Gear Rolling Inspection Fixtures—provide rapid, close check of gears.



Jigs and Fixtures—Vinco precision products made to Vinco standards.

MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Plain Cylindrical Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Shaft and Hub Gages • Built-up and Special Gages • Gear Rolling Inspection Fixtures • Indexing Fixtures • Hydraulic Power Control, Utilization and Distribution Units • Engineering, Design and Development • Precision Production Parts.

They Came to VINCO

With a job that had to be licked

We delivered — — — delivered SO well that our customer intimated he would be very happy if his competitors were kept in the dark about it; for he is producing powdered metal parts, and the accuracy and finish of the VINCO made elements are largely responsible for the decided edge he holds over competing manufacturers.

We appreciate this customer's position, so will say no more. But we are not betraying a confidence when we say that the same knowledge and skill which served him so successfully is also available to others in solving similar precision problems.

This battery of VINCO Master Involute Checkers is an essential factor in our precision production of toothed parts. They accurately show the "angle of roll" and the amount of deviation from true involute profile, thus holding scrap to an absolute minimum. Investigate the VINCO Master Involute Checker; it could be a vital cog in your production program. Detailed [illegible] on request.

MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

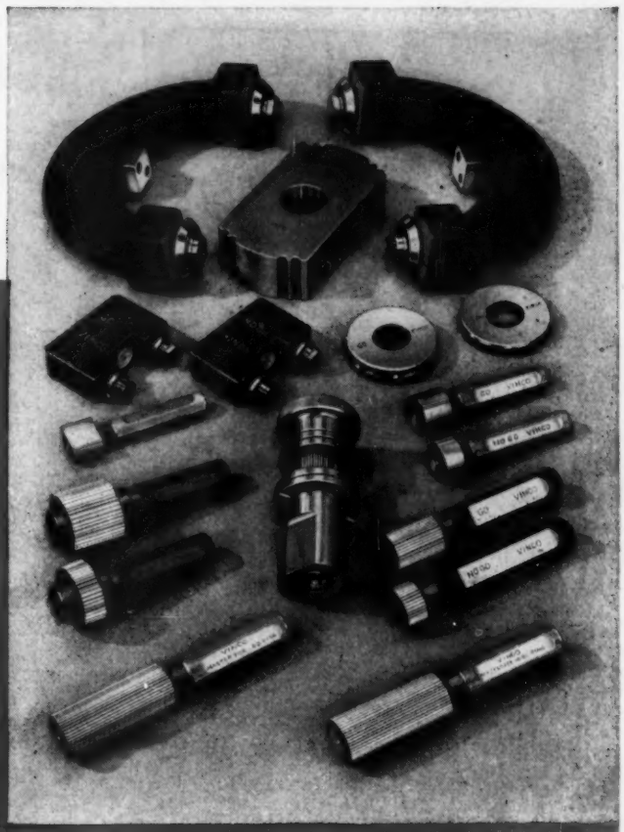
VINCO CORPORATION, 8551 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN, SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Plain Cylindrical Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Shaft and Hub Gages • Built-up and Special Gages • Gear Rolling Inspection Fixtures • Indexing Fixtures • Hydraulic Power Control, Utilization and Distribution Units • Engineering, Design and Development • Precision Production Parts.

VINCO pioneered in the development of spline gaging and was the first to demonstrate the importance of an absolute control over all the essential elements of spline gages during production.

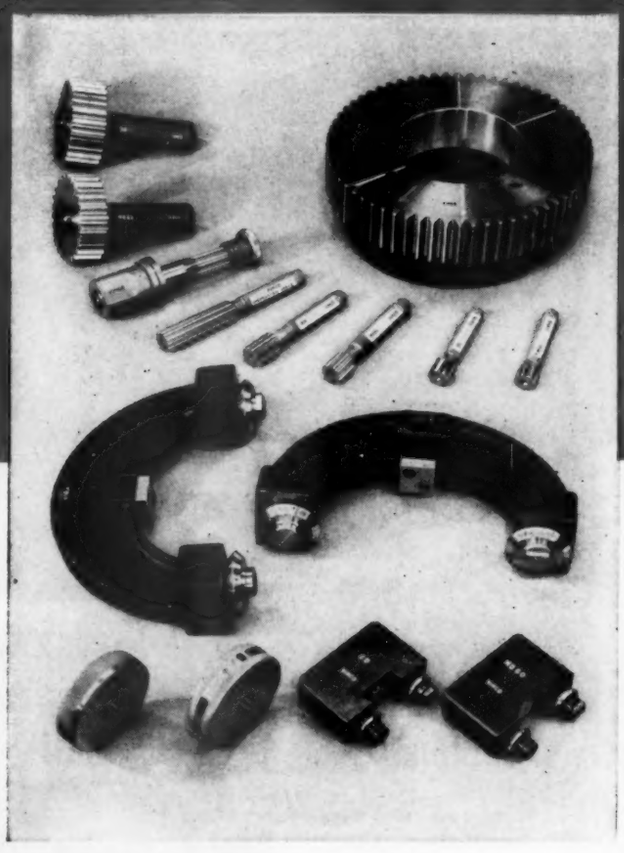
It was clearly indicated that production of splined parts depended on a clear concept of the overall gaging requirements and a proper use of the gaging equipment. Indiscriminate use of contradictory or incomplete gaging methods only created confusion during production and resulted frequently in improper assembly; a direct result of failure to establish and adhere to a proper and comprehensive gaging policy. That is why we strongly urge a thorough survey of gaging requirements before production. The only practical approach to this survey is an early consultation with gaging engineers who are specialists in analyzing and developing efficient gaging control programs for production schedules. A proven, reliable source for this highly specialized information can be found at VINCO. VINCO's Engineering Department, backed by years of study and development, is thoroughly qualified for this important service to splined parts production.

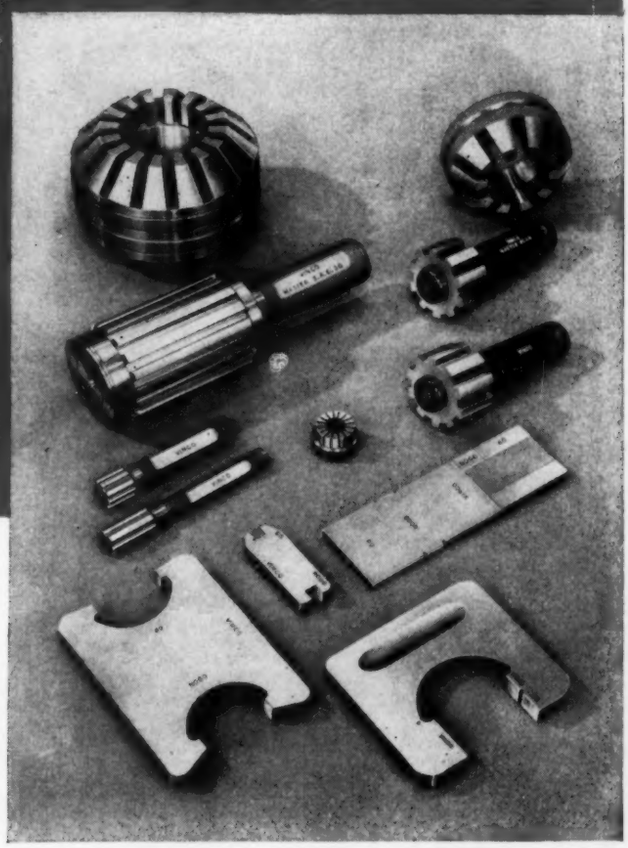
VINCO CORP. • DETROIT 27, MICHIGAN



Serration Spline Gages

Involute Spline Gages

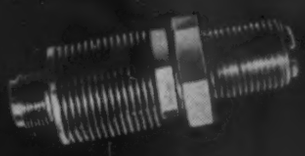




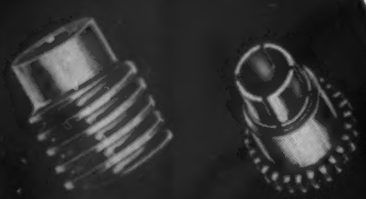
Straight Sided Spline Gages

Improve

CLOSE TOLERANCES (±.0001") and the need for easy, low-cost machining called for Carpenter Stainless No. 5 bar stock on precision parts for the Norden bombsight.

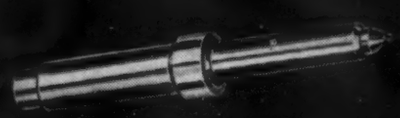


FREE-MACHINING Stainless Steels were invented by Carpenter. And easier machining reduces rejects, cuts costs on jobs like this finned spark plug.



FEWER REJECTS on your precision jobs like these torpedo mechanism parts will mean lower unit costs, as well as improved performance for your products.

SALES APPEAL and freedom from rusting is important in many places where fastenings are used. So gleaming, permanent Carpenter Stainless is used.



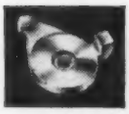
AUTOMATICS turned out this precision part from Carpenter Stainless No. 8 bar stock. It shows what can be done with this Stainless.

THE CARPENTER STEEL CO., 109 W. Bern St., READING, PA.

more than corrosion resistance

PRODUCT PERFORMANCE AND LOWER YOUR UNIT COSTS-

where you use Stainless Steel!



Even Stainless Steels of the same analysis aren't all alike. And the differences become most apparent when they are put to the test of in-the-shop fabrication. Where one Stainless will be troublesome to machine, another will cut freely. The difference can be traced to the care and quality control that goes into the making of each Stainless Steel.

When Stainless is made under the rigidly controlled conditions of a tool steel mill only the finest quality can result. And that's just how Carpenter Stainless is made. When you add the advantages of Carpenter's pioneering research—Free-Machining Stainless Bars and ductile Stainless Strip—you have the most uniform, easy-working Stainless Steels available.

You can start now to reduce the cost of using Stainless. The way to do it is to specify "Carpenter" on your orders for Free-Machining Stainless bar stock. Standard sizes are available for immediate delivery from conveniently located warehouse stocks. And don't hesitate to call in your nearby Carpenter representative. He can give you useful hints to speed fabrication and get jobs done at less cost.

. . . ANOTHER REAL HELP FOR STAINLESS STEEL USERS!

A Handy Method for Identifying Stainless Steels

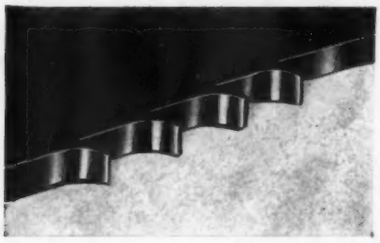
Even in the best regulated plants, steel stocks sometimes do get mixed. And you know the troubles a mix-up can cause in heat treating, machining, stamping, welding or other Stainless fabricating operations. To help you eliminate this problem, the Carpenter Laboratories have developed this chart which explains 8 different tests for identifying various types of Stainless. It shows when and how to use each test. To obtain a copy, simply send us a note on your company letterhead. Write today.

Carpenter STAINLESS STEELS

BRANCHES AT Buffalo, Chicago, Cincinnati, Cleveland, Dayton, Detroit, Hartford, Indianapolis, New York, Philadelphia, Providence, St. Louis

ARMSTRONG

SYSTEM OF TOOL HOLDERS



As each chip is comparatively light, a planer will, with this tool, carry with ease a feed and depth of cut much greater than is possible when using an ordinary tool, and there is much less tendency to "break out" at the end of cut.

DOUBLES (even triples) PLANER PRODUCTION

The ARMSTRONG Gang Planer Tool not only ends costly delays for "tooling-up", it actually reduces planing time as much as 75%—multiplying machining profits proportionally. It is the correct tool for planing large surfaces. Carrying 4 square cutter bits, this tool makes not one but four cuts with each traverse of the bed. The head of this tool swivels and is graduated so that it can be quickly and accurately set to any desired feed.

The Armstrong System of Tool Holders provides the correct tools for every operation on lathes, planers, slotters and shapers. Each is an efficient profit-building tool — a permanent multi-purpose ARMSTRONG TOOL HOLDER that "Saves: All Forging, 70% Grinding and 90% High Speed Steel". Your industrial distributor has them in stock.

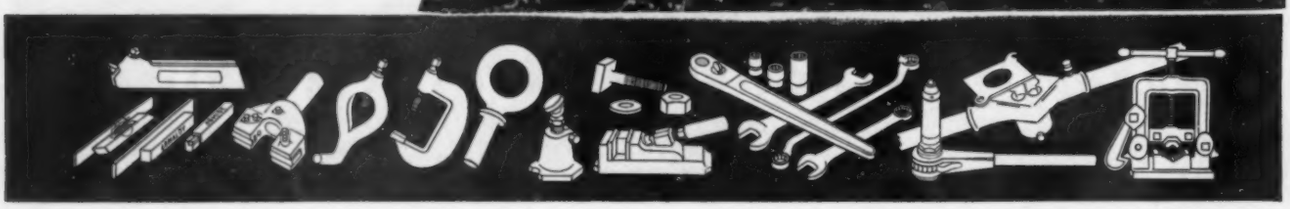
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave. Chicago 12, U. S. A.

Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.

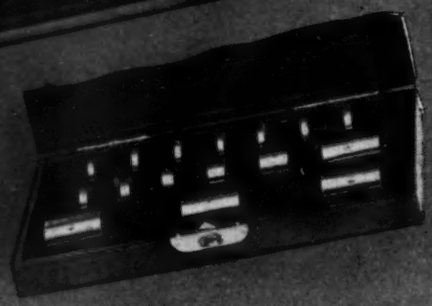
Pacific Coast Whse. and Sales Office: 1275 Mission St. San Francisco 3, Calif.



Van Keuren

MICROGAGES

Set MTT MICROGAGES. 35 Gages giving 140,000 combinations $95.00



Set MT MICROGAGES. Over 5,000 combinations in thousandths $35.00

A FOUNDATION FOR ACCURACY FOR 25 YEARS

VAN KEUREN MICROGAGES are high precision working gages, designed for use on all ordinary work and economically practical for use in production because of their low cost. Their great value in general shop use lies in the fact that they enable the workman to achieve the accuracy required by the inspector.

MICROGAGES are of first quality oil hardening alloy tool steel, exceptionally hard, carefully seasoned, with accurately flat and parallel mirror-like surfaces. They combine readily by wringing together and because of their size (11/16" dia.) are ideally suited for checking heights; widths, slots, machine set-ups, gage setting and many other uses. They are made round in order to assure the best distribution of wearing surface, which is about equal to that of rectangular gage blocks.

MICROGAGES up to 1" in length have a tolerance of plus .000015" minus .000010". They average 5 millionths of an inch oversize which provides the WEAR ALLOWANCE feature of these gages.

VAN KUREN MICROGAGES are available in sets especially designed for general shop use, for gage setting and for toolmakers and machinists. Individual MICROGAGES in standard sizes are also available in a size up to 6" in length.

Toolmakers MICROGAGE SET M64. Gives 121 combinations. $15.00

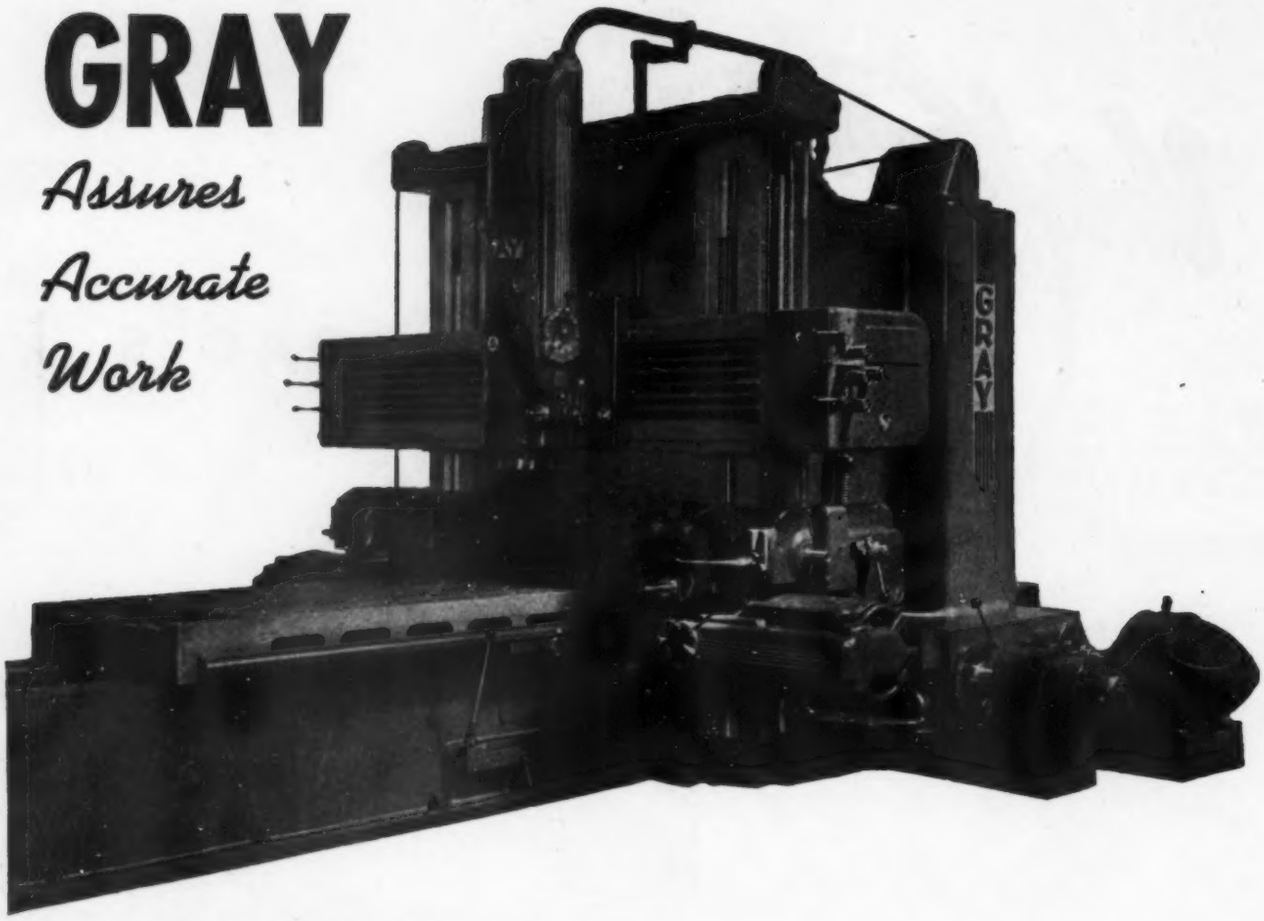
Complete details on MICROGAGES and the full line of Van Keuren Precision Measuring Tools are contained in Catalog No. 32, a 144-page manual for toolmakers, machinists and inspectors—sent promptly on request.

Van Keuren

27th YEAR

GRAY

Assures Accurate Work



with the Patented

GRAY AUTOMATIC RAIL LEVELER

To produce accurate work, it is essential that the rail be level at all times.

By a simple patented device, the rail of a GRAY Planer or Milling Machine is automatically raised slightly before it is reclamped. This raising takes out the back lash between elevating screws and nuts, and so automatically relevels the rail.

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

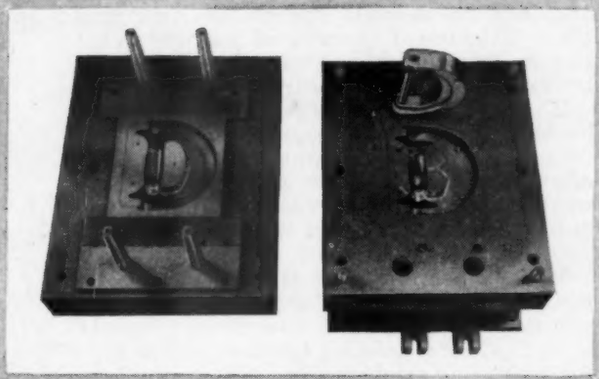
This is only one of the many GRAY advantages incorporated in GRAY machines. For complete information write for our Bulletin #51.

The G.A. **GRAY** *Co.*

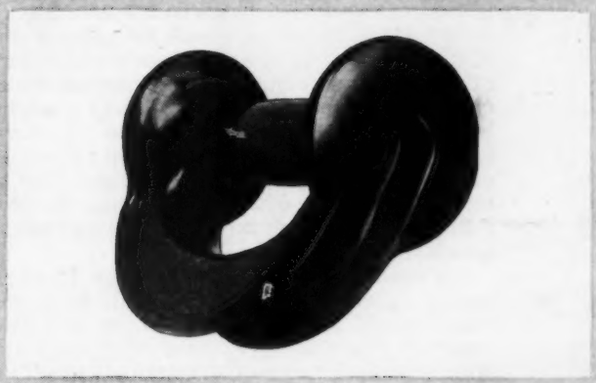
CINCINNATI 7, OHIO, U.S.A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • **SOLD IN LATIN AMERICA BY MACHINE AFFILIATES**

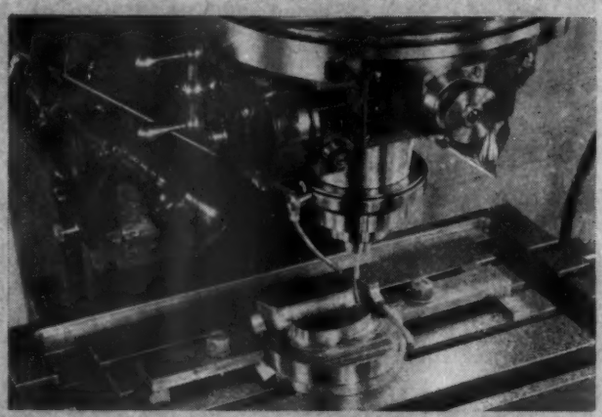
Could you machine this Mold without the Cost of Templets or Models?



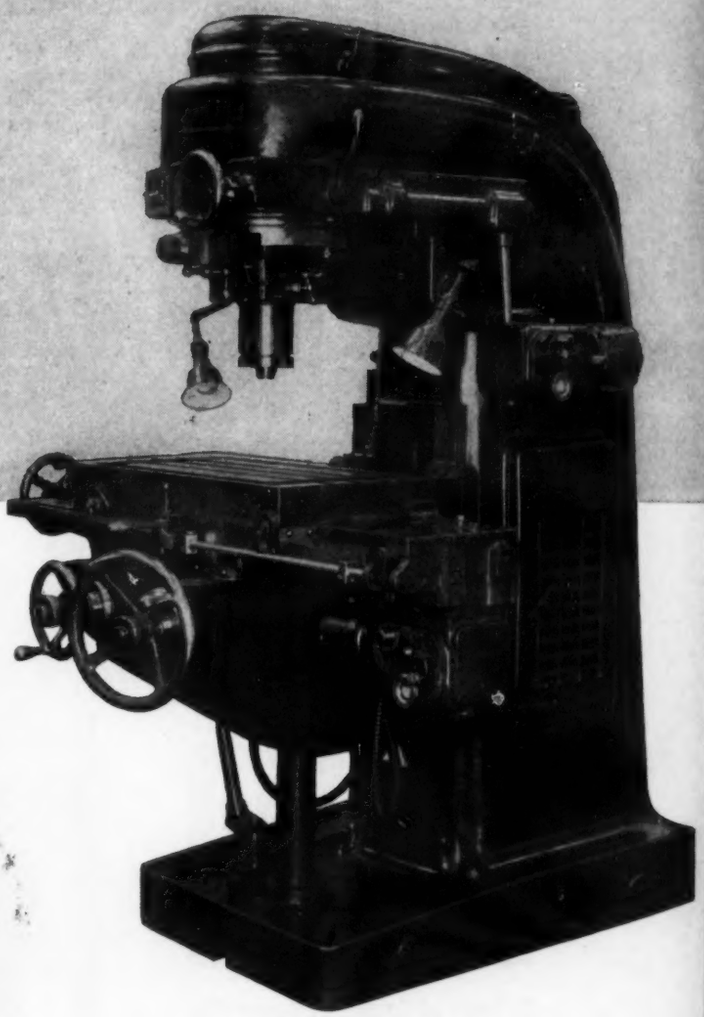
This switch handle transfer mold, using SAE 3012 steel, was made from blueprint dimensions without model or templet.

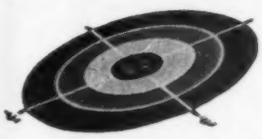


Plastic switch handle as produced by the Kline Manufacturing Co., Galena, Ohio from mold illustrated opposite.



Making complete mold on a K & T Rotary Head Milling Machine assured exact production to drawing specifications — reduced total production costs.





TOTAL TIME for complete mold was 35 hours, employing an inexperienced operator. Little hand-finishing was required. With more operating experience, time could be reduced by milling both halves of the mold in one setup. This is just one example of the outstanding performance a Kearney & Trecker Rotary Head Milling Machine can give you in toolroom, experimental and manufacturing work. SAVES TIME — it mills intricate shapes in a single setup, transmits blueprint dimensions direct to the workpiece without aid of models or templets. AVOIDS ERRORS — it gives you exact control of all mechanical movements. SAVES MONEY — initial preparation and multiple setups are eliminated. Production goes up — costs go down. For further information, write for Bulletin 1002C today!

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC BORING MACHINES

Kearney & Trecker
Products
CORPORATION
MILWAUKEE 14, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

SNYDER PRESENTS A NEW DEVELOPMENT IN RAILROAD CAR WHEEL BORING

This special-purpose, automatic-cycle machine is designed and built by Snyder specifically for rough and finish boring wheels for railroad cars.

Its particular significance to railroads and to other industries employing comparable metal-cutting techniques on large, heavy castings, is that this machine combines improved accuracy with increased production rate and is engineered to maintain its efficiency over an estimated lifetime of 20 years. In these respects it constitutes a definite advance over existing practice.

On steel wheels, the cutting time for finish boring ⅛″ stock per side is 1 minute 20 seconds for a hole 7″ long and 7″ diameter. The same amount of stock is removed from cast iron wheels in 50 seconds. Cutting tools are T. C. tipped.

Chamfering and facing a 1½″ flange may be performed simultaneously with the boring operation.

A 19″ stroke is provided so that rough and finish boring may be performed in succession. (On the set-up shown, rough and finish tools are mounted close together so that operations are, in part, simultaneous.)

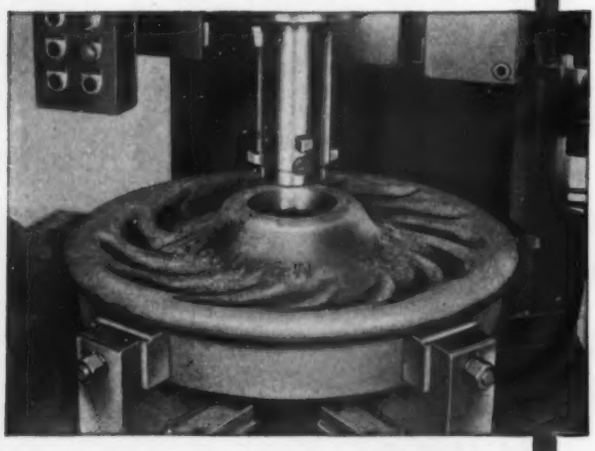
Spindle feeds are from 2″ to 24″ per minute and various spindle speeds are provided through the use of a four-speed selective transmission or a variable speed motor. Spindle is heavy-duty with taper roller bearing mounting.

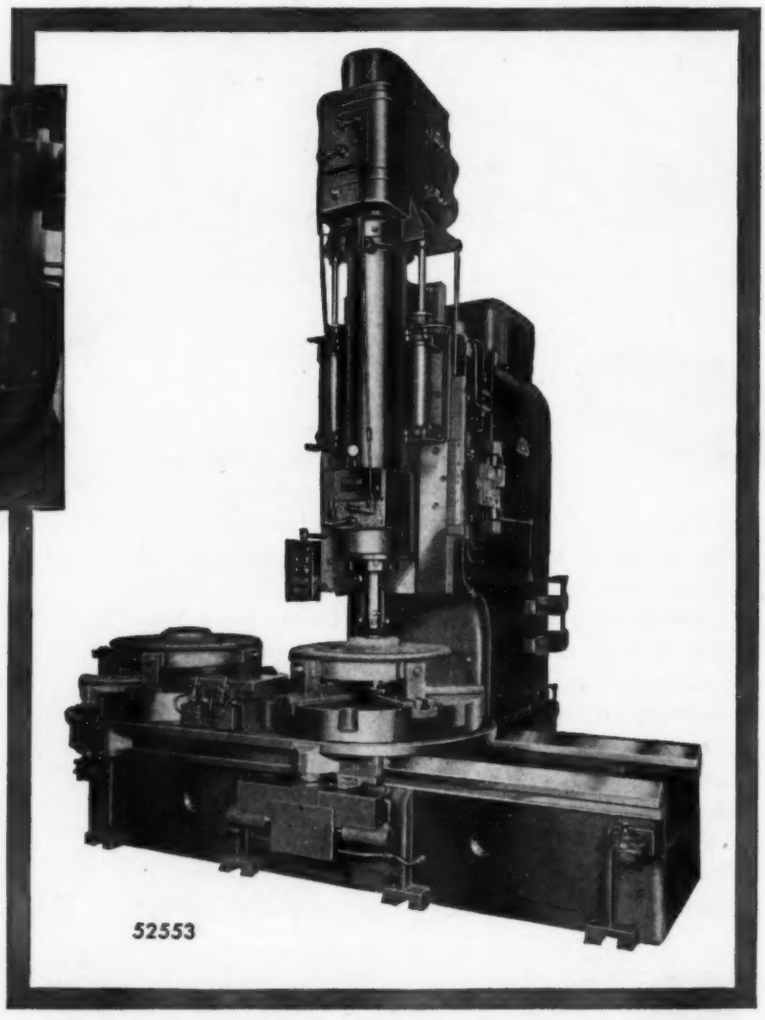
The table travels upon V-ways, case-hardened, ground and automatically lubricated to provide smooth operation. The V design allows for normal wear without side-play which would impair accuracy. Table travel is by hydraulic actuation with 5-second time interval.

Work is held by two 5-jawed chucks of 42″ capacity, operated by individual hydraulic cylinders. Work-cycle is automatic. Capacity is 20 H.P. for a finishing machine and 30 H.P. for a roughing machine.

The advances represented in this machine—greater accuracy, higher production, longer life, automatic operation (practical for unskilled help), maximum safety—are typical of the advantages offered in Snyder-engineered special-purpose machines.

We invite your inquiries. Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.





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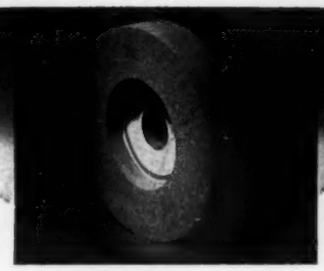
SNYDER

DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

21 Years of Successful Cooperation with Leading American Industries

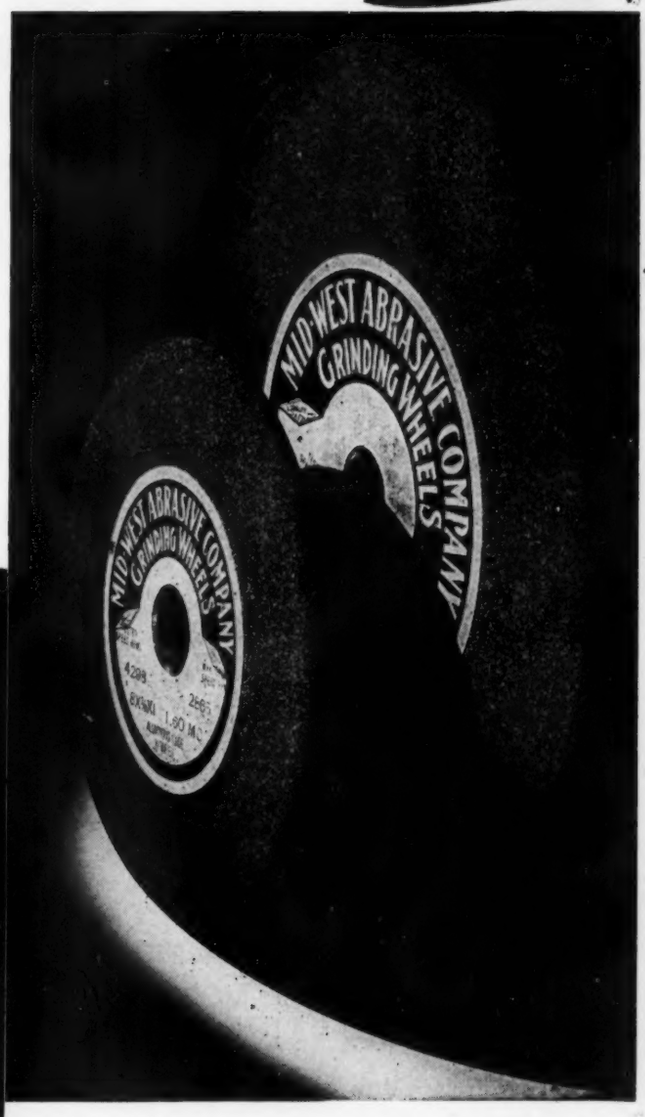
Proven QUALITY



Proven quality and dependability of performance are hallmarks of the products of the Mid-West Abrasive Company.

Mid-West's outstanding successful tool room grinding wheel, and every other product of the broad Mid-West line—honing stones, sharpening stones, coated abrasives, disks and wheel dressers—all must bear these two hallmarks.

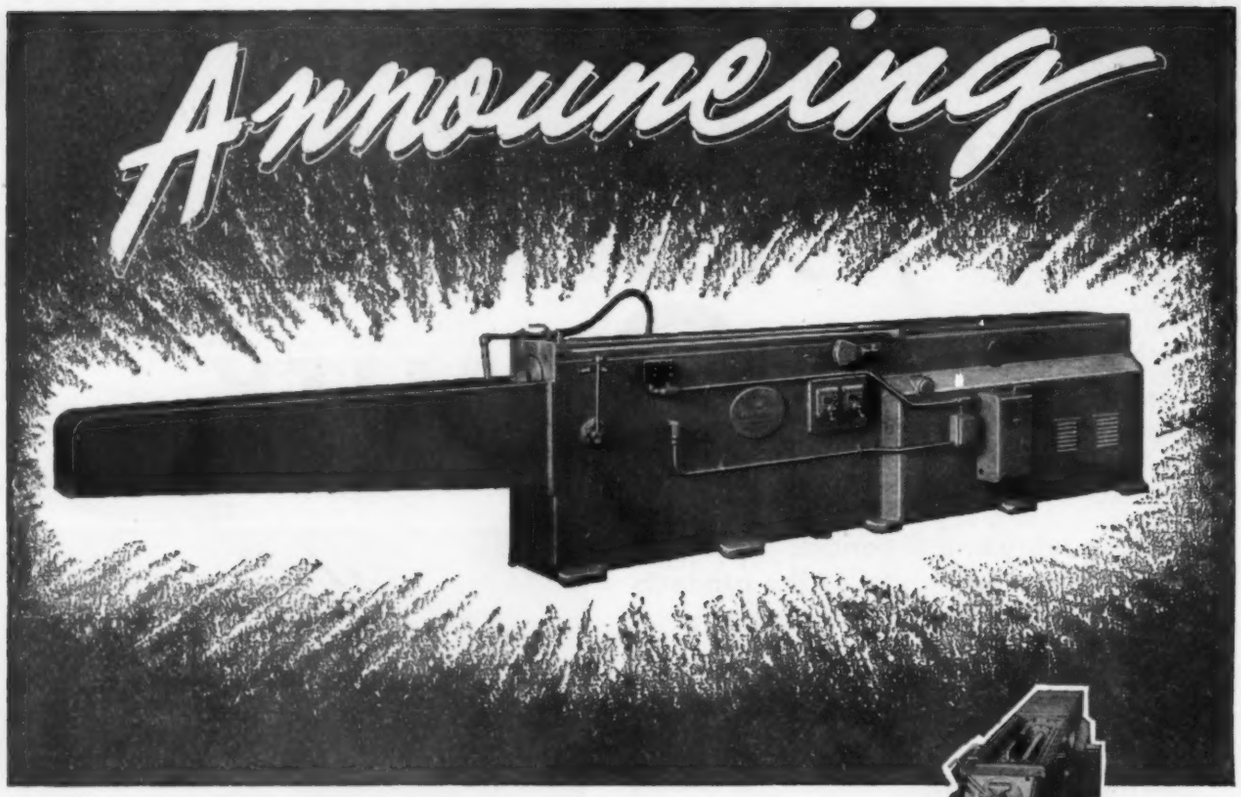
Let engineered quality and dependability guide you in your choice of abrasives, and we feel certain that choice will be Mid-West. Prompt delivery on all items.



MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. • Detroit • Rochester, Pa.



A NEW *American*

HORIZONTAL BROACHING MACHINE

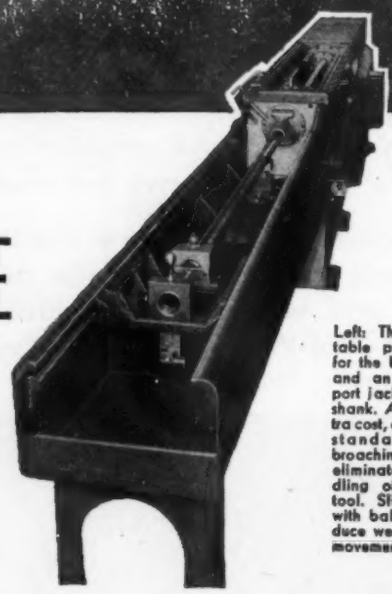
For Heavy-Duty Internal and Surface Broaching

Engineered by *American*, this new horizontal broaching machine is designed to perform a wide variety of internal and surface broaching operations. It is particularly adapted to heavy-duty broaching involving the removal of a large amount of metal or broaching of large work pieces. As always, fast, accurate production with fine finish is possible.

This new *American* machine is made in two standard sizes, as shown in the table below:

	MODEL HD-15-66	MODEL HD-20-66
Pull Capacity	15 tons	20 tons
Stroke	66"	66"
Maximum Length of Broaching Tool	72"	72"

Write for complete details on these and other *American* broaching machines.



Left: This outer support table provides a guide for the broach rear pilot and an automatic support jack for the broach shank. Available, at extra cost, on all *American* standard horizontal broaching machines, it eliminates manual handling of the broaching tool. Slide is equipped with ball bearings to reduce wear and facilitate movement.

MEMBER BROACHING TOOL INSTITUTE

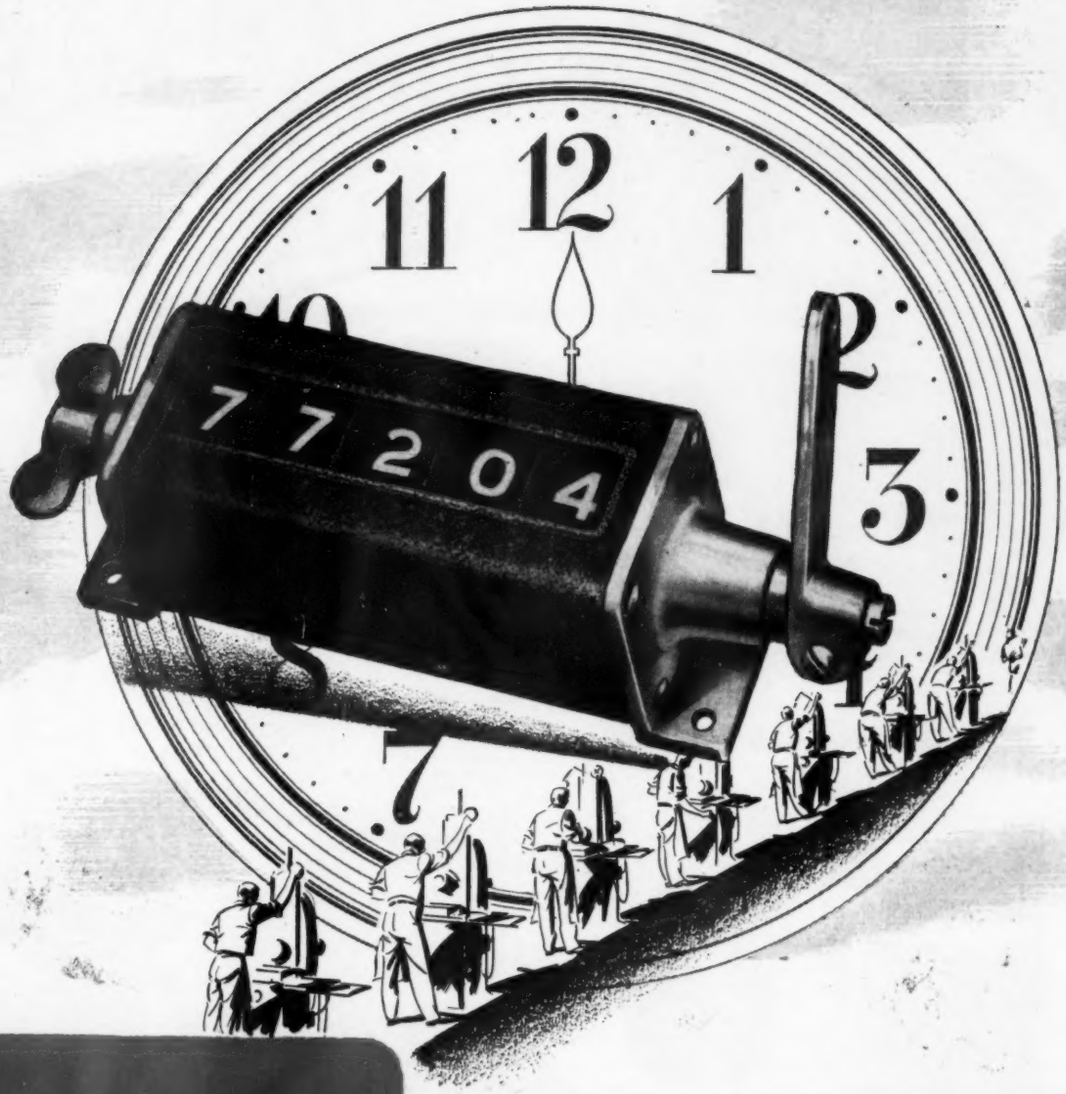
American BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF S



Production Really runs like Clockwork

...when it's geared to Veeder-Root "COUNTROL"

Clocks tell only part of the story on production. But when you relate *elapsed time* to the figures of Veeder-Root Devices . . . then you've got the *whole story*, complete and up-to-the-minute.

For Veeder-Root "Facts in Figures" tell you at a glance whether you are actually getting the full quota of production scheduled for each hour, shift, or day. And if you're not getting it, they show you the lag-points and also the exact extent of the lag. Wherefore, plants in every line of industry rely on these figures as the basis of complete production *Count*rol.

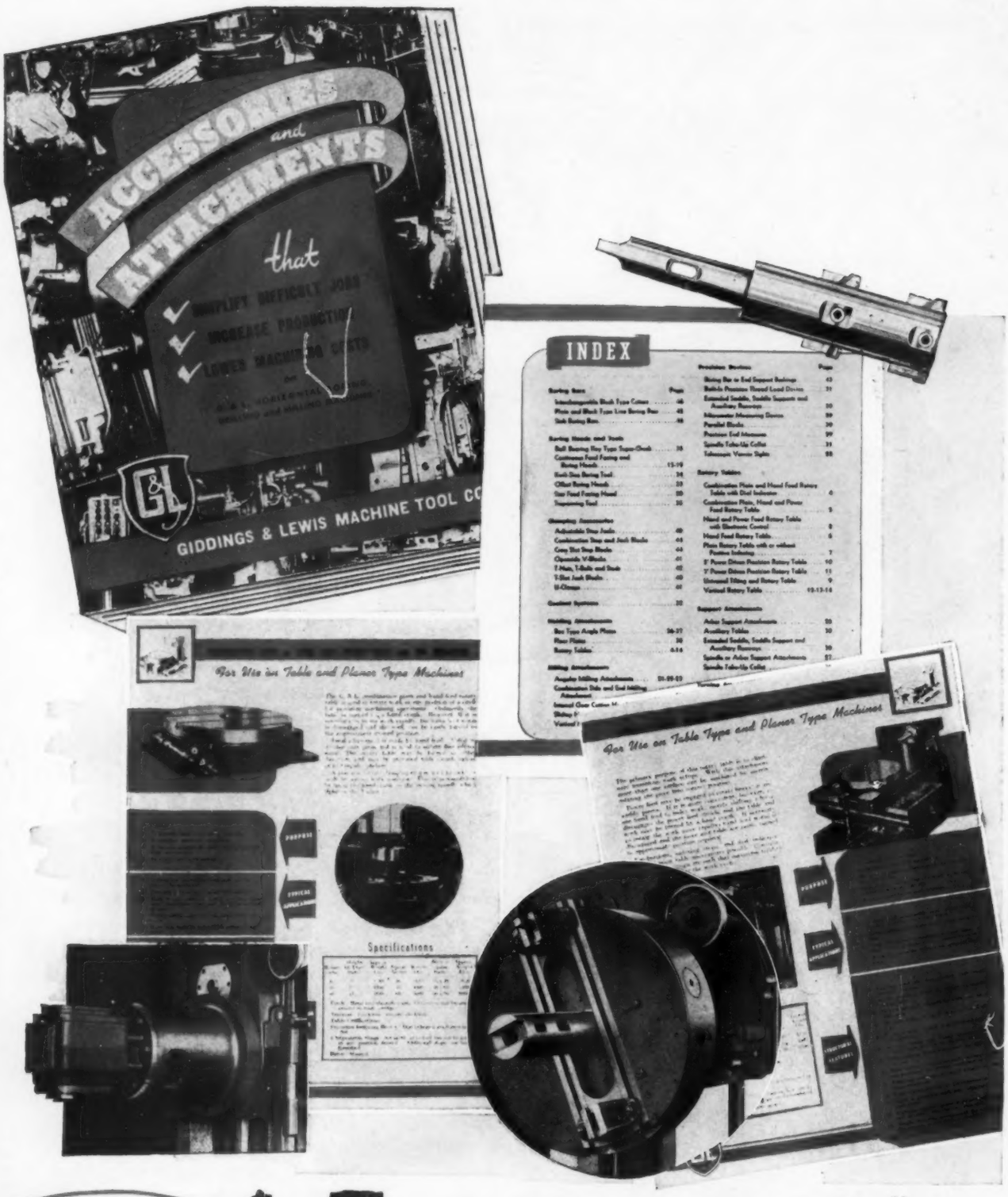
You can get this complete Veeder-Root *Count*rol in *your* plant, too . . . with Veeder-Root Devices that count or measure mechanically or electrically, in any units you require . . . turns, strokes, pieces, electric impulses, or what have you? They're inexpensive, and they're quick and easy to install. Write.

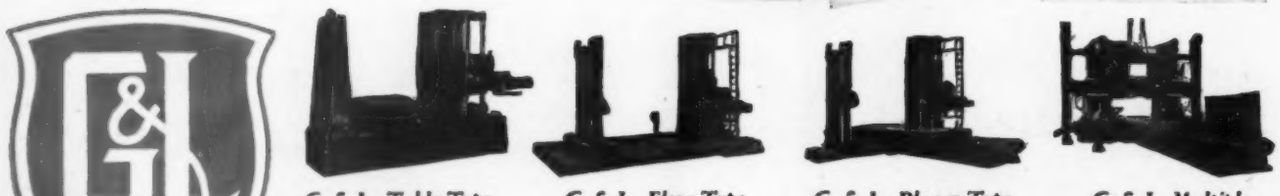
The Counting House of Industry

VEEDER-ROOT INC.

Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., Montreal
In England: Veeder-Root Ltd. (New address on request)





G. & L. Table Type Machine | *G. & L. Floor Type Machine* | *G. & L. Planer Type Machine* | *G. & L. Multiple Head Type Machine*

GIDDINGS & LEWIS MACHINE TOOL CO.

ARE YOU USING YOUR G.&L. MACHINE

To Best Advantage?

STANDARD ACCESSORIES AND ATTACHMENTS MAKE POSSIBLE COMPLETING DIFFICULT JOBS FASTER AND IN FEWER WORK SETTINGS *ON A SINGLE MACHINE*

Many difficult and unusual machining jobs ordinarily routed to special tools may be handled to better advantage and more rapidly on a single G. & L. machine suitably equipped with standard attachments. These attachments include rotary tables, Continuous Feed Facing Heads, angular machining heads, arbor supports, micrometer measuring devices and other supplementary equipment for standard and special work. When used, they increase the working range of the machine which results in profitable time savings, savings in labor and increased accuracy.

ATTACHMENTS MAKE MANY MORE JOBS PRACTICAL ON A G.&L.

Horizontal, universal and vertical rotary tables index work accurately for alignment and simplify work setup.

The Continuous Feed Facing Head will turn studs and trunnions as well as face, backface, bore, groove and recess.

Straddle milling operations are accomplished easily when plain and cross-rail type arbor supports are used.

Angular milling attachments are designed to perform many operations at right angle to machine spindle.

To perform multiple boring cuts, improved line and stub boring bars with adjustable block type cutters are used.

Users of Giddings & Lewis Horizontal Boring Machines can best determine increased machining possibilities through attachments by referring to the **New** G. & L. accessory catalog. In this 48-page book will be found not only descriptive details of attachments but also application information, specifications and photographs.

Write Today...

for complete information on accessories and attachments for Giddings & Lewis machines. This **Free** book is written especially for men interested in increasing production on their G. & L. machines. Obtain your copy now.

138 Doty Street • Fond du Lac, Wis.

342 holes held to .0002" limit with JIGMIL automatic positioning

38 x 63 x 2¾" Thick
Steel boiler plate
Hole dia. limit .0001"
Overall Spacing Limit .0002"
The world's finest Jig Boring and Milling Machine

HOOVER TOOL & DIE COMPANY

March 4, 1946

DeVlieg Machine Company
450 Fair Avenue
Ferndale 20, Detroit,
Michigan

Gentlemen:

Enclosed is a photograph showing job done in our shop on the 36 Jig Mill.

PART: Master Plate
SIZE: 38 x 63 x 2-3/4" thick
MATERIAL: Steel Boiler Plate
HOLE DIA. LIMIT: .0001"
OVERALL SPACING LIMIT: .0002"

As machine table travel is 48", it was necessary to reset work. This did not affect accuracy and the time made was highly satisfactory.

Very truly yours,
HOOVER TOOL & DIE COMPANY
C. W. Richter - Vice President & Chief Engineer

CWR:B
Enc. 1

Here are the results obtained by one user of 3-B DeVlieg JIGMILS on a difficult boring operation. The JIGMIL will also cut costs in your plant because:

(1) Only one set-up required for both boring and milling operations.

(2) Centralized Push Button Control Panel and Slide Lock Levers operated through finger-tip pressure.

(3) Automatic spacing to within .0001" of setting permits unvarying accuracy on jigs, fixtures and duplicate parts.

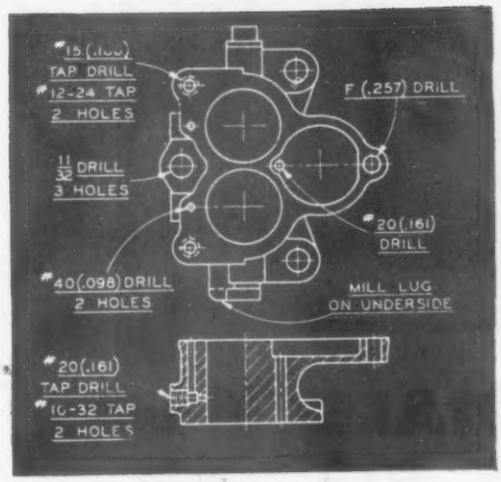
Technical literature available upon request. Write today.

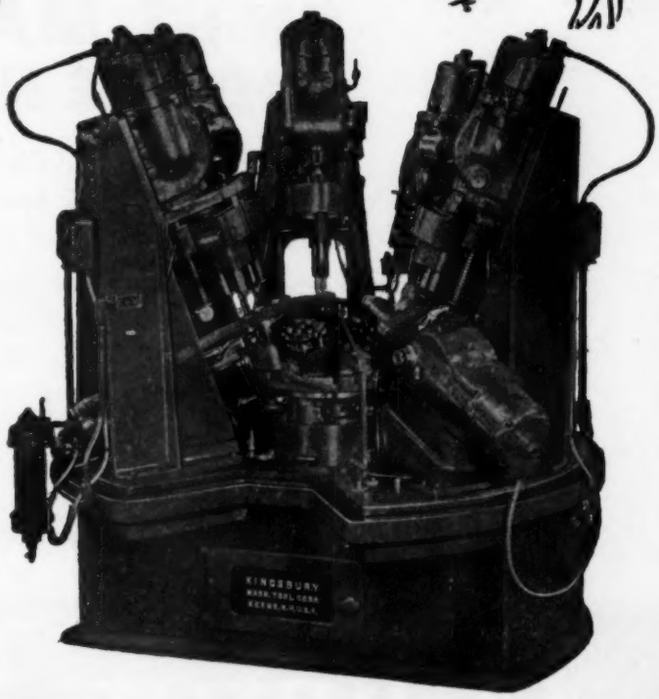
DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

FLEXIMATIC

The THRIFTY *Way*

To Solve Production Problems





Multiple operations with standard automatic units is the Fleximatic way to reduce man hours per piece. Each Fleximatic is individually engineered to obtain the maximum production rate with the prescribed accuracy.

The automatic indexing Fleximatic shown performs over a dozen operations on carburetor throttle valve bodies in one chucking. While the operator removes and chucks the work, the machine drills, taps, and mills, as shown, in 7.5 seconds.

Let our Engineering Department solve your production problems the thrifty way. Send them a sample part or print. No obligation, naturally.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

MATERIALS

RIGHT MATERIALS FOR THE RIGHT JOB

In today's competition for increased production, higher speeds and lower costs, cutting tools must be constructed of the very best materials.

We, at Winter Brothers, are materials conscious. In our extensive metallurgical laboratory we make exhaustive tests of materials before purchasing and before using. We are constantly testing and checking material as it moves from bar stock to finished taps.

We are proud of our position in the threading tool field and zealous to maintain that leadership.

It pays to specify Winter Taps.

Winter Brothers

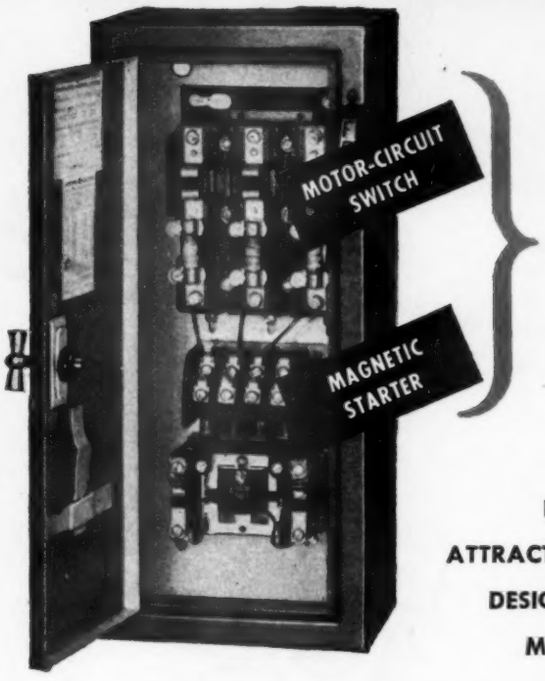
COMPANY

Wrentham, Massachusetts, U.S.A.

BRANCH STORES SAN FRANCISCO CALIFORNIA · CHICAGO ILLINOIS · DETROIT MICHIGAN

A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., ROCHESTER, MICHIGAN

MOTOR STARTERS EVERY TYPE, EVERY KIND, FOR EVERY MACHINE APPLICATION



COMBINATION STARTERS

DEPENDABLE . . .

ATTRACTIVE IN APPEARANCE . . .

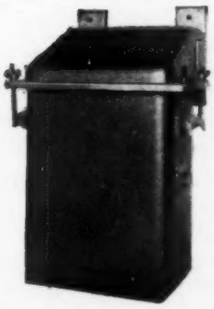
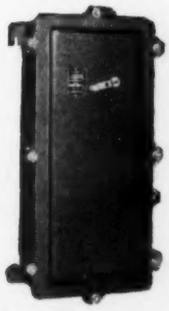
DESIGNED TO BLEND WITH MODERN MACHINES

Advantages of Combination Starters

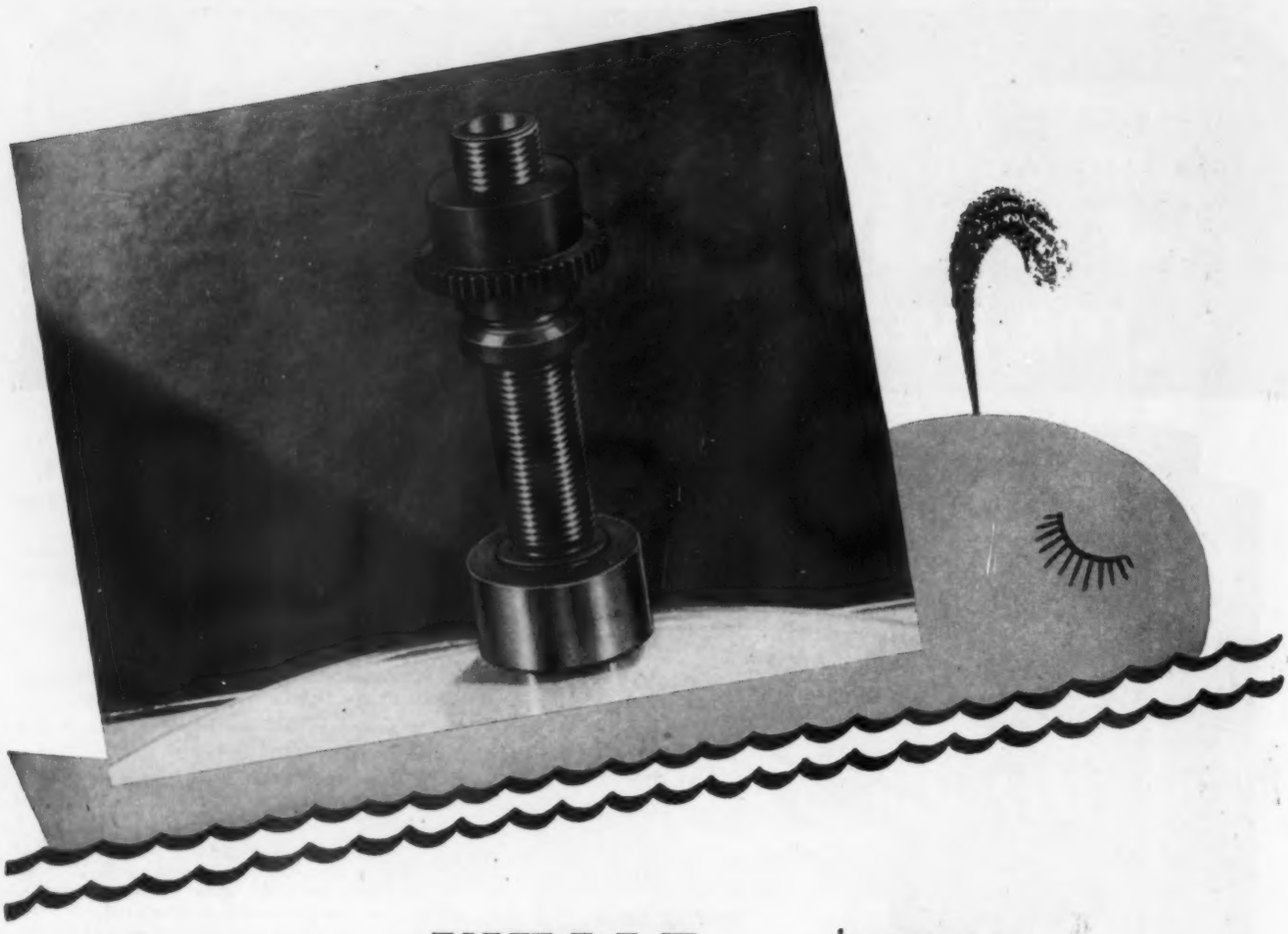
1. ***50% reduction in mounting time*** — You mount only one device, not two.
2. ***40% reduction in wiring time*** — Connect to only 9 terminals, not 15. The switch and starter come connected.
3. ***Sure safety*** — Cover cannot be opened while power is on the starter.
4. ***Reliable motor protection*** — Protection devices co-ordinated at factory.
5. ***Saving of wall space*** — The one device takes less space than two.
6. ***Improved plant appearance*** — Single, streamlined case; less open wiring and conduit.

Whatever your plant's operating condition, you can get a suitable G-E combination control. This means a motor-circuit switch (with short-circuit protection) and a magnetic starter—in one compact, easy-to-mount unit.

Write today for more information about these combination starters. Our engineers will be glad to help you select just the right starter for your application. *General Electric Co., Schenectady 5, N.Y.*

GENERAL PURPOSE	CORROSION RESISTANT	DUST-TIGHT	FOR HAZARDOUS LOCATIONS	WATERTIGHT
				
Suitable for general-purpose indoor applications where atmospheric conditions are normal.	Made for corrosive atmospheres and hazardous locations. All arcing parts and terminals (of forms for hazardous locations) are at least six inches under oil.	For use in steel mills, cement mills, and other locations where the dust content of the atmosphere is heavy.	Designed to withstand internal explosions. The flanges are ground to tolerances which will not permit the escape of gases.	Suitable for outdoor use, and for damp places indoors, such as dairies, breweries, and ship docks.

GENERAL ELECTRIC



There's a WHALE of a difference in GEARS by ---

FRACTIONAL HORSEPOWER GEARING

GS

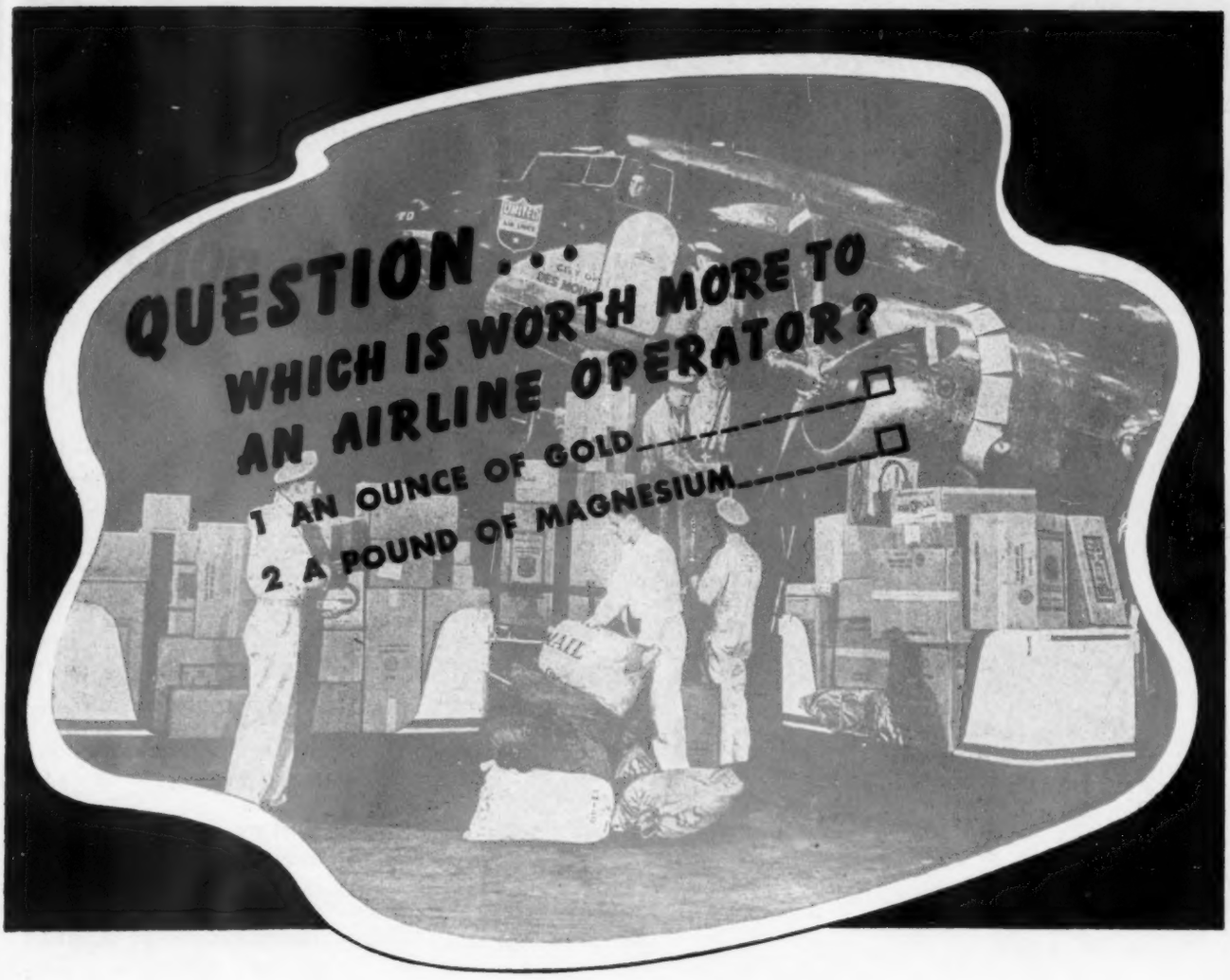
The quantity production of GS custom-made small gears has been developed we believe, to a degree of *uniform* excellence unapproached in the history of the industry! The most extreme precision characterizes every operation. If you must achieve the utmost in smooth, dependable, economical performance, ask a GS engineer about the fractional horsepower gears you need. We can apply to *your* problem, all the skill, the experience, the exclusive methods and machinery developed thru a quarter century of specialization in the manufacture of *better* small gears.

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS



You can put your check mark on No. 2 right now, because—

Payload is the pay-off in the airline operator's business. A pound of dead weight saved means a pound of payload added and, in a year's time, that's worth $100 per plane to him*. An ounce of gold is worth only $35.

Lightweight American Magnesium products are helping accomplish this payload boosting weight-saving in airliners.

Magnesium Will Help Boost Your Pay-Off

Whether you're moving materials, have products that must be moved, or machines with moving parts, you can doubtless employ American Magnesium products to similar advantage. Our engineers will gladly help you determine where and how.

Then, get in touch with American Magnesium for dependable magnesium castings, forgings, shapes, and sheet. Call the near-by Alcoa office, or write:

Aluminum Company of America, Sales Agent for American Magnesium products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

**Average saving estimated by 4 leading U. S. airlines*

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

then he said to himself

If it doesn't make sense . . . it's nonsense

ONE thing you can bank on when Foreign Secretary Anthony Eden talks . . .

. . . he usually smacks his point with direct words.

. . . Just weigh those he used in a recent speech before the House of Commons. Says he:

"Every succeeding scientific discovery makes greater nonsense of oldtime conceptions . . . "

AND THAT MAKES SENSE.

"The Nonsense of Oldtime Conceptions," *he says*

LOOK, A. E., at a newtime discovery in fabrication of metal products that makes sense. This wheel, for example:

OLD

Wheel failed at less than 170 lbs. pressure.

NEW

No wheel Failure. Tire bursts at 340 lbs.

Streamlined and twice as strong

PRODUCT: Wheels for pneumatic tires. Stamped in two halves from 14-gauge steel. Thickness at center of rim reduced to 16 gauge due to deep draw.

OLD DESIGN: Riveted construction. When tested by inflating tire, wheels failed at less than 170 lbs. pressure.

NEW DESIGN: Welded construction. With same test, tire bursts at 340 lbs. Only change in wheel is spread of 9/32" between outer edges of rim. Wheel is streamlined.

WELDING: Two halves are joined by "Lincolnweld", the new Lincoln automatic shielded arc welder. Weld circumference 25 inches. *Welding time 10 seconds.* Floor-to-floor time 45 seconds per wheel.

LINK-UP WITH LINCOLNEERING for ideas in engineered arc welding—design and production. Call the nearest Lincoln office for this service. No obligation. Machine design sheets on request. Write on your letterhead.

THE LINCOLN ELECTRIC COMPANY • Dept. 291 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

PRECISION

- Dynamically balanced design.
- Guaranteed to turn or bore within .0002" dia. in five inches.
- Self-centering collet work-holding method.
- Vibration-free ball-bearing spindle.
- Positive turret reindexing within .0003".

VARIETY

- Eight successive operations finish-machined at one chucking.
- Internal or external thread chasing.
- Double tool slide for straight or taper turning, forming or cutting off.
- Uses push-out or draw-in collet, step or jaw chuck.

EASE OF OPERATION

- Single lever spindle speed control.
- Self-locking turret head.
- Positive stops for duplicating size.
- Vee-belting replaceable without disturbing spindle or drive.
- Automatic brake; pneumatic bar feed.

The Rivett No. 918 Plain Cabinet Turret Lathe is an efficient producer of small duplicate parts. The combination of true running work and precise tool indexing creates a place for this turret lathe in fine manufacturing.

If you have a production problem requiring second operation or initial machining of small finely made parts from stainless steel, brass, plastic or other material, the Rivett 918 guarantees a lower cost solution. Write for Bulletin 918T.

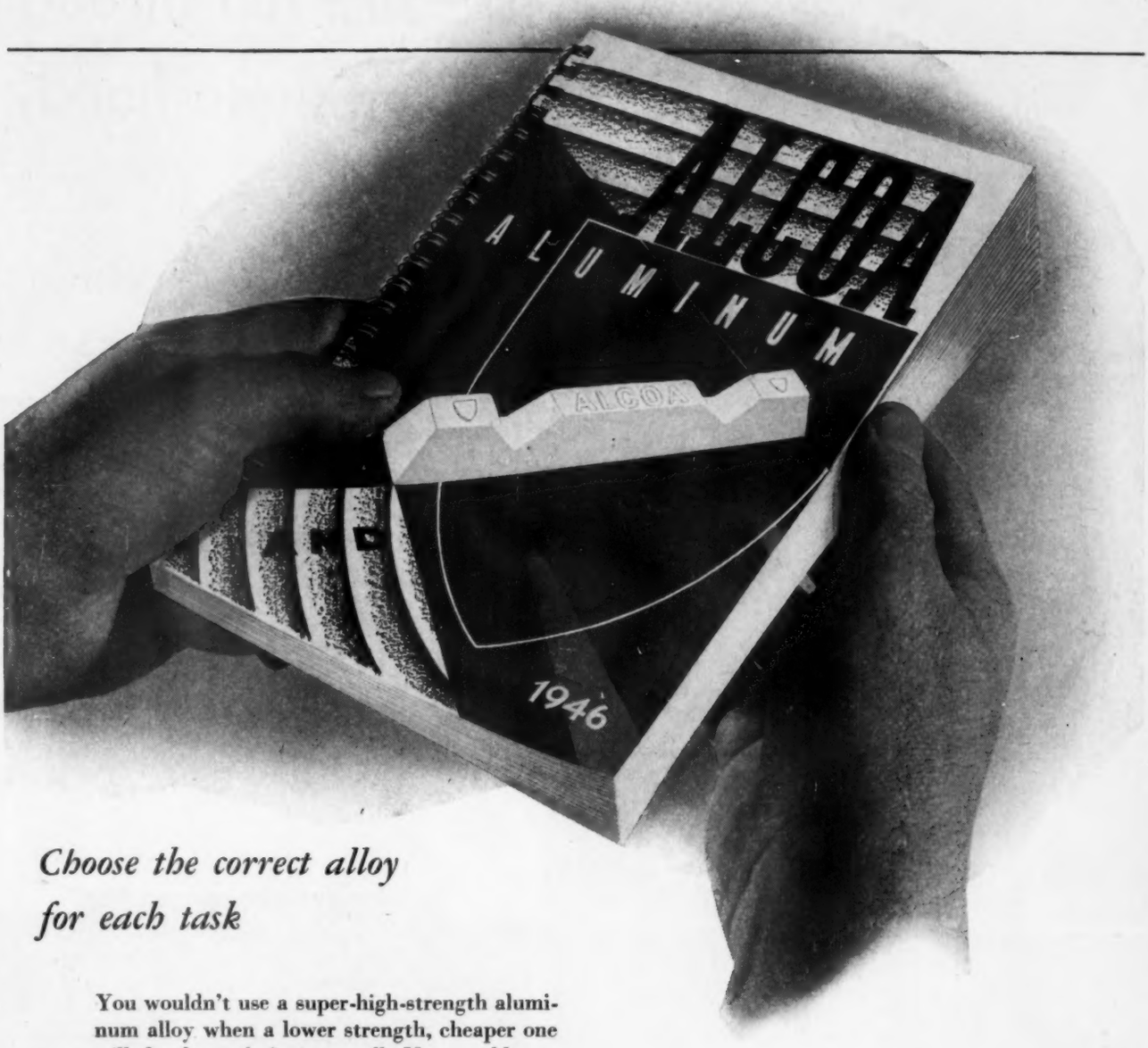
RIVETT

ARMY E NAVY

RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS. · U. S. A.

Alcoa Aluminum IS A LOT OF *Alloys*



Choose the correct alloy for each task

You wouldn't use a super-high-strength aluminum alloy when a lower strength, cheaper one will do the task just as well. Nor would you employ an alloy that's especially designed to withstand outdoor exposure when all it's asked to do is "look pretty" at some inside location. And so on—

You spend less money when you're correctly advised on the selection of materials. Which is where Alcoa engineers fit into the picture. Calling on their years of experience in developing, testing and fabricating aluminum alloys, they are usually able to say, "That's the alloy to use." You get into production without delay.

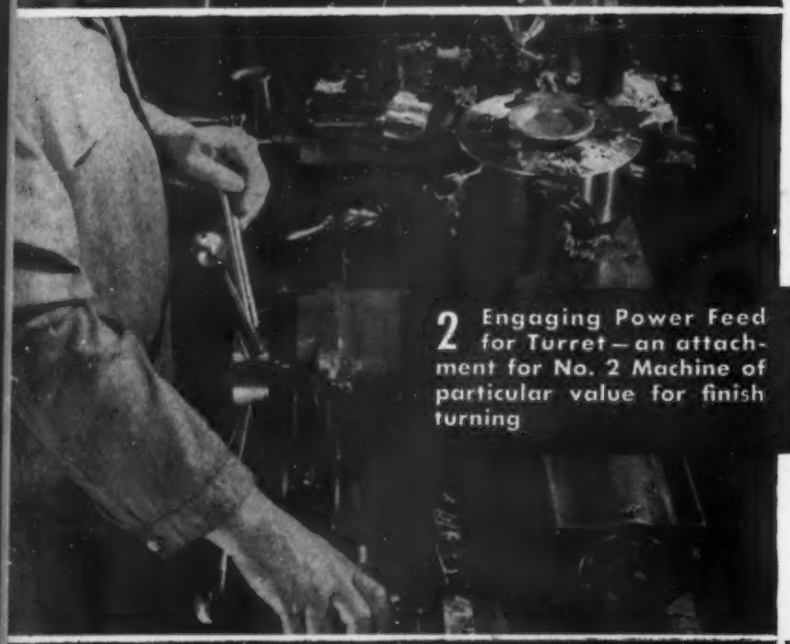
To help you select aluminum for the usual jobs, Alcoa offers the book, "Alcoa Aluminum and its Alloys." For a free copy, write:

ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

1 A tap of the hand opens chuck, feeds bar and closes chuck . . . all in ¾ second



2 Engaging Power Feed for Turret—an attachment for No. 2 Machine of particular value for finish turning

3 Momentarily shifting the spindle clutch and brake lever to engage low speed for threading with opening die

4 Advancing turret for facing cut and simultaneously taking forming cut using screw feed of cross slide

SO SIMPLE

—Just run through a cy

on these *handy* . . . W

SC

You'll appreciate their operating ease with minimum number of controls—so profitable on short runs On

Cro

20

Full facilities for completing pieces from bar stock

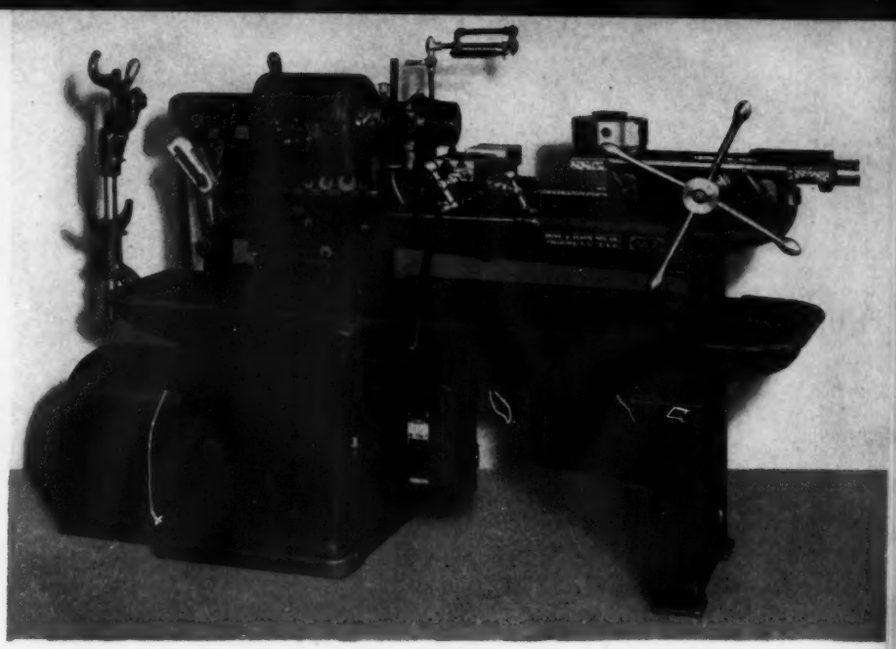
Adj

BROWN &

AND FAST!

cycle of operations

WIRE FEED SCREW MACHINES



One lever controls spindle—forward, backward and brake

Cross slide has lever feed for quick action. No. 2 Machine also has screw feed

20 spindle speeds—efficient high speeds in proper relation to slow threading speeds—ranging from 3620 to 175 r.p.m. on No. 1 Machine and 2485 to 125 r.p.m. on No. 2

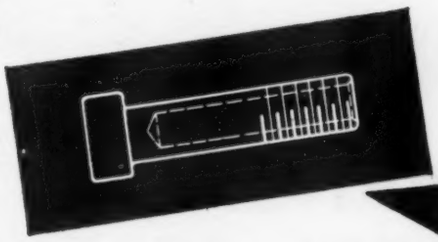
Adjustable stop for each turret tool

★ No. 1 Machine takes stock to ⅝" dia. (⅞" for light work).

★ No. 2 Machine (shown) takes stock to 1" dia. (1¼" for light work).

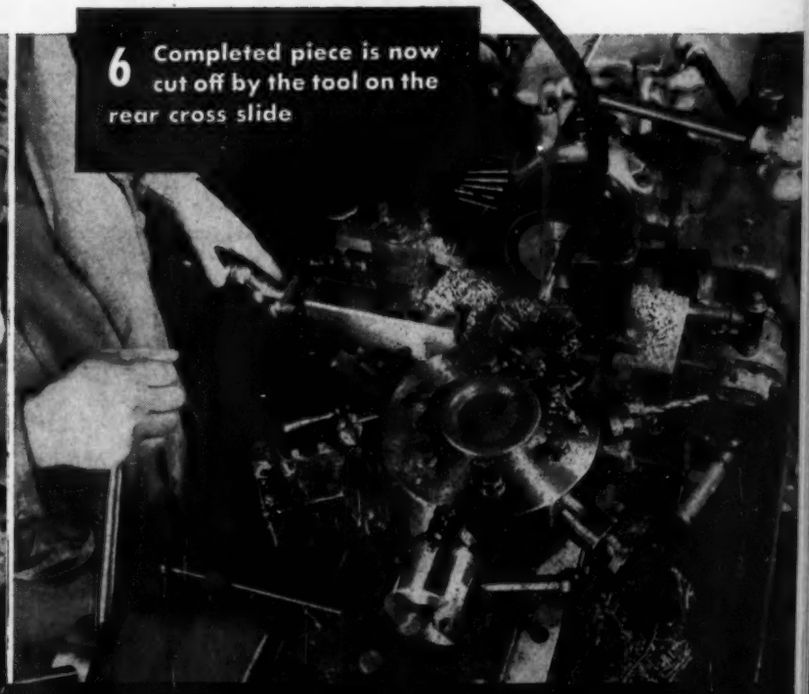
Ask for Booklet giving details

B·S BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.



. . . and the machine is quickly set up to perform **second operations** at the same high productive capacity

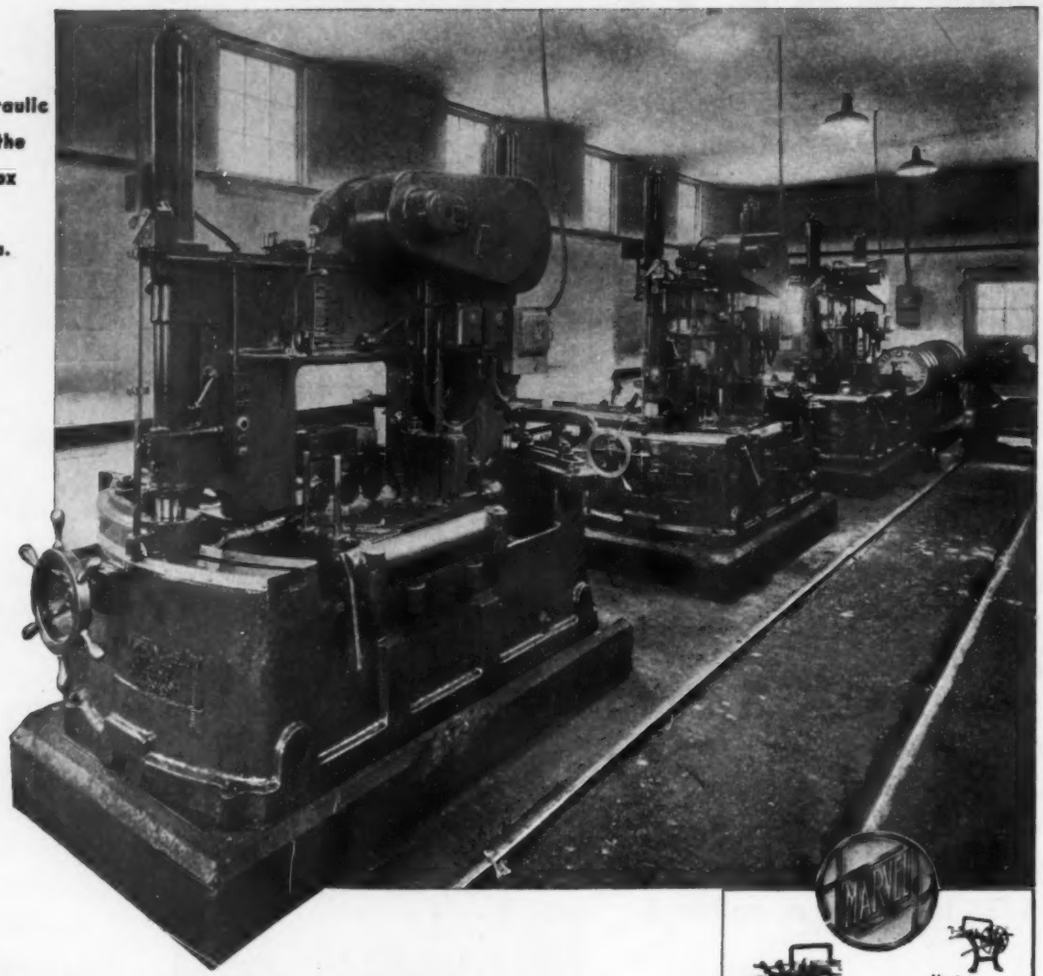
5 Turret is run back to automatically index, automatic feed is engaged for drilling, and forming cut is completed



6 Completed piece is now cut off by the tool on the rear cross slide

SHARPE

3 MARVEL #18 Hydraulic Hack Saws at the Babcock & Wilcox Tube Co.— Beaver Falls, Pa.



EASILY CUT-OFF TOUGHEST STEELS

Steels just don't come too tough for MARVEL Giant Hydraulic Hack Saws. Take, for example, the three No. 18 MARVEL Saws, at the Babcock & Wilcox steel mill, shown above. These machines are used to cut test specimens from sample pieces of stainless and other tough alloy billets which are checked for seams, pipes, etc., before being drawn into tubing. It takes tough steel to make the best tubing, and it takes modern sawing equipment to cut it rapidly, accurately and economically.

With 10 types of metal-cutting saws, each available in a series of variations, MARVEL can furnish sawing machines that exactly meet your requirements. If you have a metal-sawing problem—call in the local MARVEL Sawing Engineer.

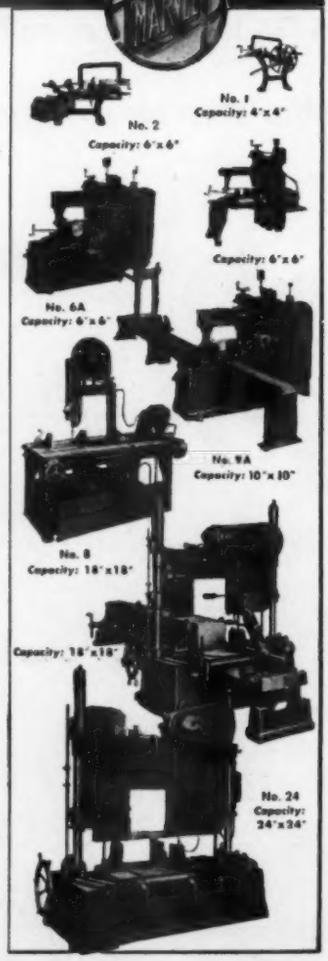
Write for MARVEL Catalog or check it in your Sweet's Catalog Files

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

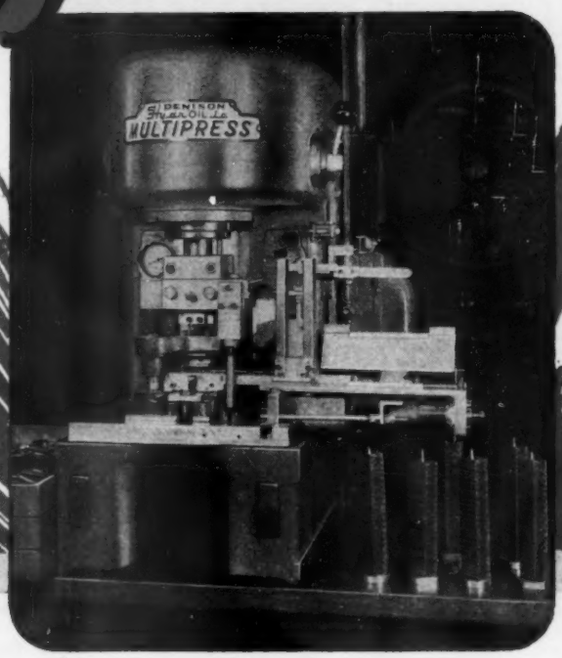
5700 BLOOMINGDALE AVENUE **CHICAGO 39, U. S. A.**

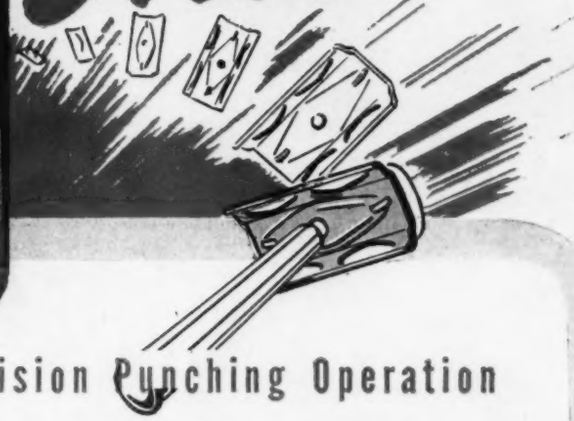
Eastern Sales Office: 225 LAFAYETTE ST., NEW YORK 12, N. Y.



MARVEL SAWS

MULTIPRESS SHAVES Production Costs for GILLETTE





Higher Output on Precision Punching Operation

MULTIPRESS proves its advantages on another task . . . punching key slots in metal safety razor guards at the Gillette plant in South Boston. Performance records show reduced "downtime" for maintenance and tooling "setups"... thus, *higher* daily production. Reduction of noise is another important factor. And this completely self-contained, fully automatic, HydrOILic press occupies less space than previously used equipment. In this case, the user designed his own automatic feed device for the versatile MULTIPRESS . . . made easier by the unit's clean lines and smooth surfaces.

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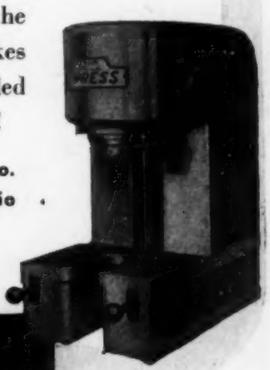

The DENISON Engineering Co.
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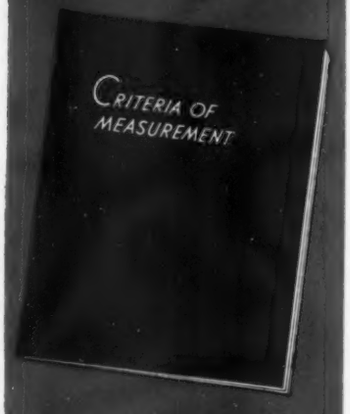

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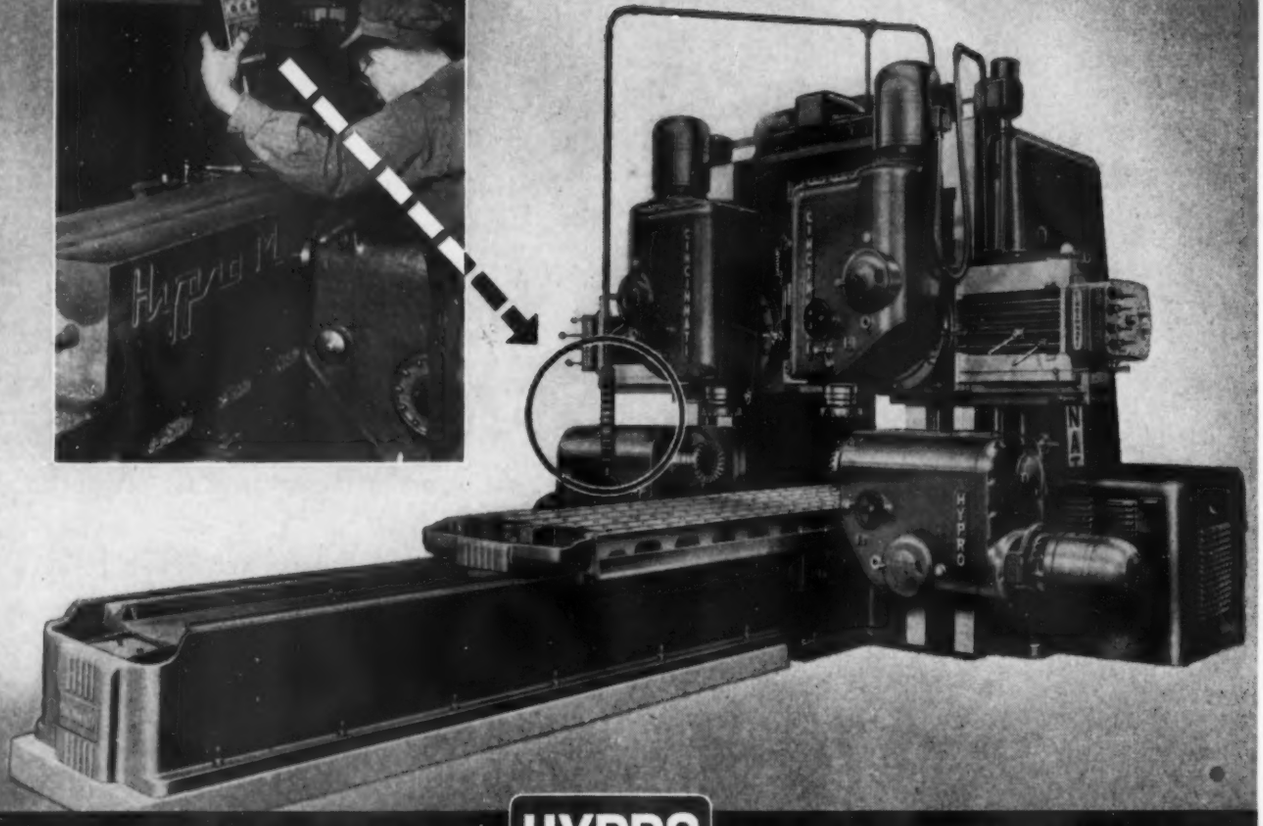
Photo on left shows operator milling the words Hypro Miller in cast-iron block — an unusual demonstration of the versatility and absolute control of any head or table from pendant station exclusively.



THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

American Machinist's Spot NEWS OF METALWORKING

New machinery, equipment and processes technologically improved since 1944 will not be subject to price control under proposed price control bill now before Congress. Object is to encourage manufacturers to apply war-developed devices to peacetime production.

Britain is expected to buy sizable volume of specialized tools such as gear cutters, large presses for stamping motor car bodies, die casting machines and automotive production machines in the United States. Nevertheless British machine tool builders anticipate high output for at least the next three years.

Domestic carriers will take bulk of railroad equipment produced in U.S. the next few years. Little will be available for foreign buyers, who will be seeking used rolling stock in this country as a result.

France plans to replace 265,000 old machine tools in modernizing its factories. About 125,000 of that number will be imported from the United States, Britain and Sweden. Some may be secured from Germany as reparations and in return for machines removed from France by the Nazis.

New Chevrolet light-car division is headed by Arnold Lenz with Earl MacPherson as chief engineer. Car will have six-cylinder engine, will sell for under $1,000, will have body built by Chevrolet instead of Fisher. Chevrolet expects eventually to make 9500 units a day of all its lines, compared with prewar peak of 6240 units.

Shortage of skilled help continues most critical problem facing tool and die manufacturers. West Coast metalworking shops have had little luck in recruiting skilled operators in east and midwest. Men trained for single-operation jobs during war lack the skill demanded by today's general machine shop requirements.

Representatives of French car manufacturers are in this country and others are expected shortly to inspect U.S. manufacturing methods and to purchase new equipment if France obtains a loan or other credits from Washington.

To build new products now being designed, tomorrow's machine tools should be as much better than today's as electric light is better than tallow candle, said J. R. Weaver at Westinghouse Forum. One machine should perform all operations on a piece. Machine would combine many dissimilar operations, be small and flexible enough to allow periodic changes in product design.

UNRRA plans to place orders in Britain for $16,000,000 of machine tools, for $4,000,000 of tele-communications equipment and $8,000,000 of steel products. It also has bought 110 locomotives and 4000 freight cars in Britain for shipment to Poland, Jugoslavia and Czechoslovakia.

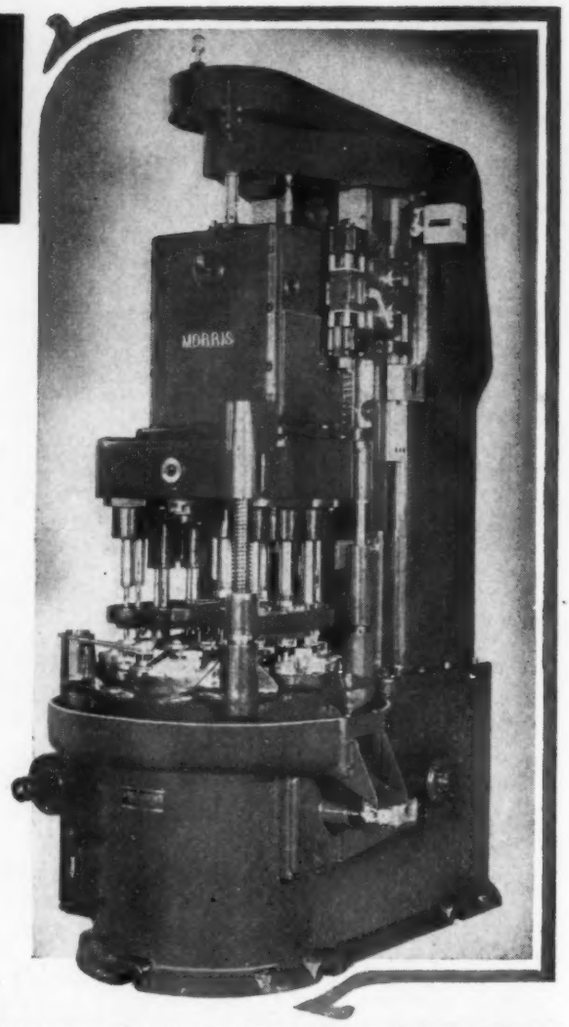
Steady rise in application of magnesium to consumer goods insures use of 75,000,000 lb. this year. Consumption may go as high as 150,000,000 lb. in 1947.

Government of India has withdrawn all restrictions on sale and acquisition of machine tools within its borders. Henceforth no license will be required for such transactions.

Initial production of Willys utility truck with four-cylinder "jeep" engine is set for August. Design is simplified, with no fancy bumpers or grilles or streamlined fenders. Fenders will be slanted in to make servicing of engine easy. Bodies for Willys '47 passenger cars will be produced at Toledo, where car facilities are being integrated.

Packard Motor Car Co. is experimenting with jet propulsion aircraft engines at its Toledo, O., plant and at Willow Run army air base. It will build small marine engines for cruiser market and continue to produce 1800-hp. PT-boat type engines.

MORRIS MOR-SPEED
Production Equipment



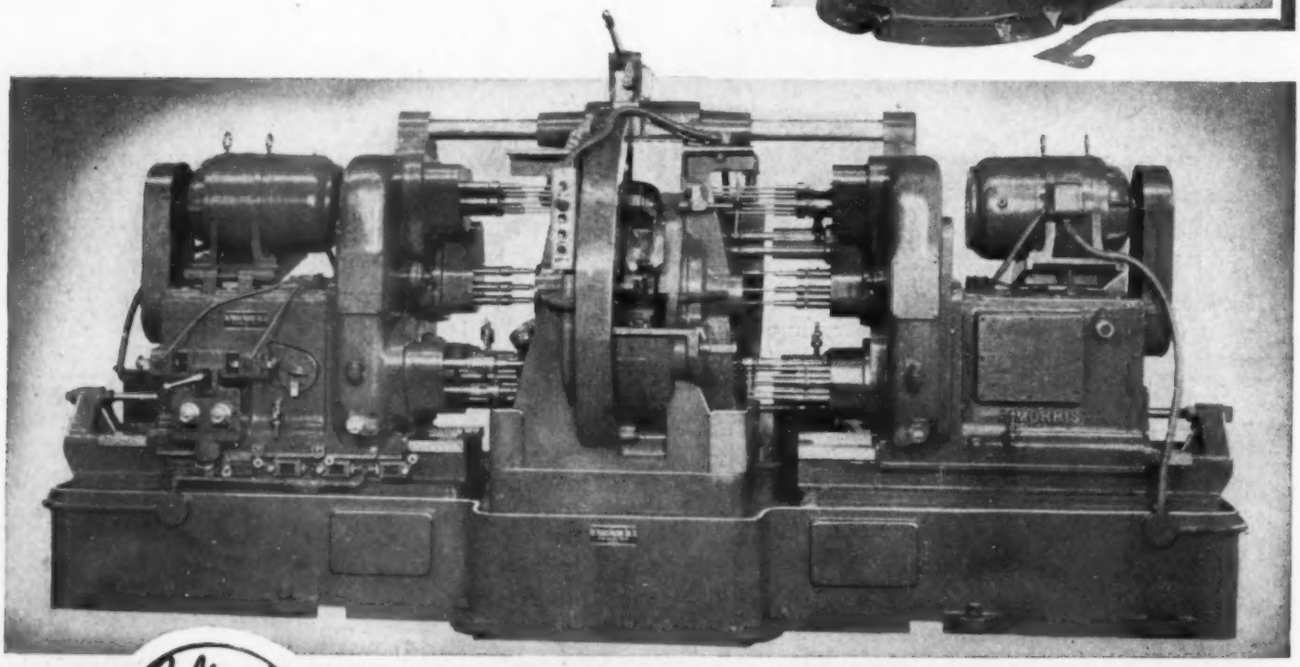
Developed to meet job conditions—increase output—reduce operating costs

The two illustrations show how Morris Engineers successfully handled two entirely different job requirements—obtained desired production—reduced costs.

At the right is a 4-station vertical, automatic indexing machine with standard self-contained hydraulic feed unit operating 14 spindles to accurately drill, ream and counter-bore steering wheel hubs . . . The self-contained hydraulic feed unit is unique in that it can be used in any position and provides a wide variety of approaches and returns as well as feeds and speeds—and is fully automatic.

Below is a horizontal two way machine. The machine consists of two 10 H. P. hydraulic feed units mounted on opposite ends of a rigid base. Forty-four spindles are mounted in clusters for drilling, boring and reaming an oil pump body from two directions. The work is rigidly held by five hand clamp fixtures and indexing is also accomplished by hand.

If you have a mass production problem involving drilling, reaming, boring and similar operations—consult Morris Engineers. They have the *"know how,"* the experience, the facilities to help you.



Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

ESTABLISHED 1877

American Machinist

BURNHAM FINNEY, Editor

What Price Relief?

OPA is to be congratulated on having granted relief to the machine tool and allied industries in an intolerable situation. Its favorable action was long overdue.

The freezing of capital goods equipment prices at 1941 levels had become absurd and unjust. For proof, one need cite only the greatly increased labor and materials costs.

Having applauded OPA, we are inclined to look critically into its ruling and to speculate upon the reasons for it at this late date.

Certain heavy types of machines were singled out to be suspended from OPA price controls. Builders of these machines no longer must make tedious and exacting reports to Washington.

But most machine tools, for some inexplicable reason, are not included in this favored classification. They still have a price ceiling, though admittedly the ceiling has been raised 20%.

Just why this peculiar separation, one type to be decontrolled and another to be continued under control, is a mystery.

It is like taking the ceiling off giraffe meat, as one observer has said. Controls come off only big machines built by a relatively few companies.

The OPA ruling strikes us as the kind of political compromise which often occurs when the government gets into the economic field.

OPA officials believed it politically expedient to "make a show" of taking controls off some products before Congress voted on the extension of the agency's life and powers. When they decontrolled some lines of equipment, they made their action appear more generous and of wider application than it really was.

With increases up to 20% permitted in all machine tools, the excuse for OPA's clinging to any further control is pretty thin. The chances are slim that machine tool prices will rise an average of much more than 10%.

OPA overlooks the fact that economic law is at work in the machine tool industry. Supply and demand are reasonably well in balance, as previously pointed out in these columns.

Many builders are out digging for business. Competition if nothing else will restrain them from raising prices beyond the barest minimum necessary to take care of increased costs.

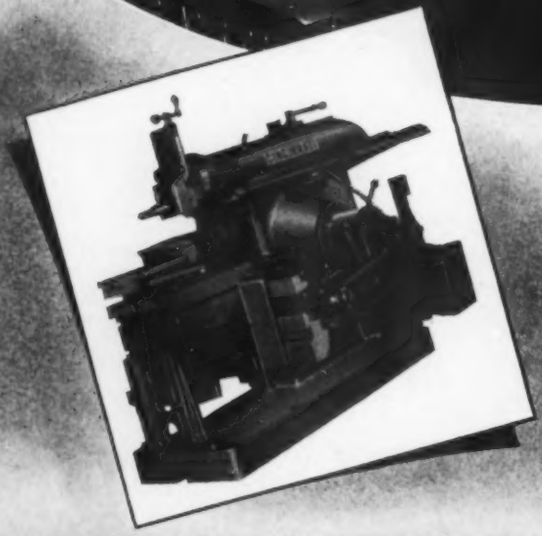
Beyond that, prices of machine tools have no bearing on prices which consumers pay for end products. Buyers would not purchase machine tools unless they knew that the machines would lower costs and contribute to higher production.

Why then continue price control at all of machine tools and allied products? Could continuation be influenced by the desire of OPA officials to perpetuate their jobs? We don't know. We are merely asking the question.

OPA will do a much better job if it pulls in its operations a bit and concentrates on the consumer field, where it will have plenty to keep it busy. It is time for it to stop fussing around in an industry which by any measure whatsoever does not need to be policed.

Burnham Finney

THEY ARE *dependable-*



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Behind the scenes, men and machines work to keep the iron horse healthy.

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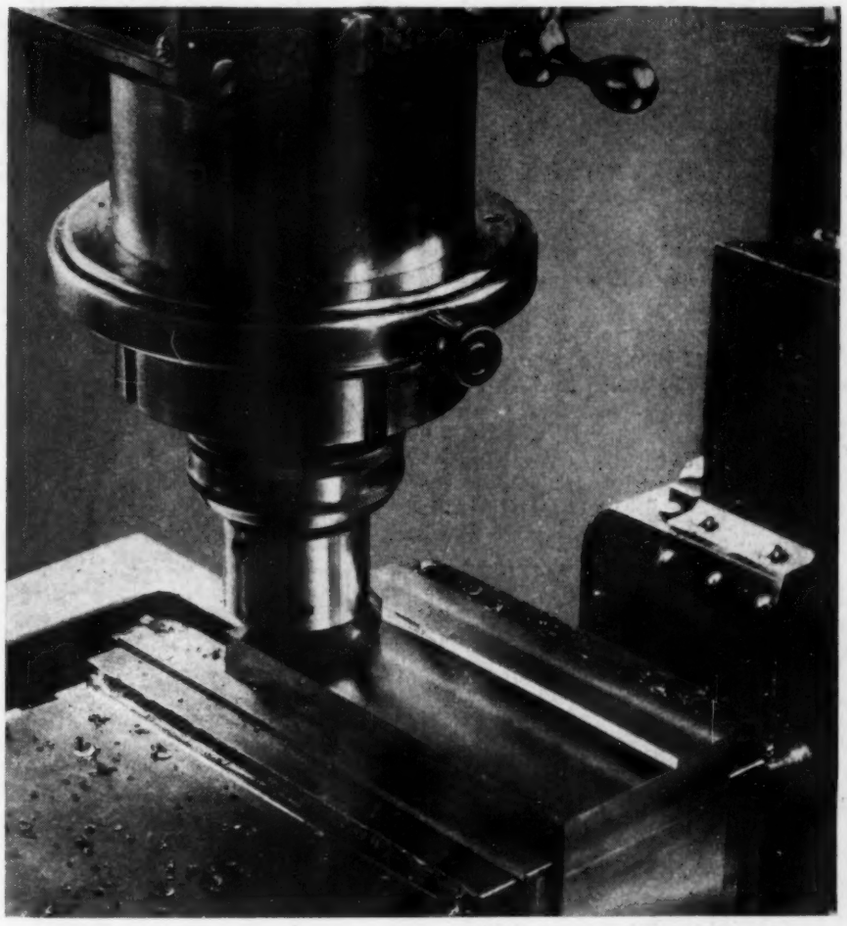
SHAPERS · SHEARS · BRAKES

Plant Committee Coordinates Application of Carbides to Milling

BY A. O. SCHMIDT AND D. V. STEVENS
KEARNEY & TRECKER CORPORATION

Techniques derived from research are applied to jobs in the shop, and a carefully detailed record of each application is made for practical guidance in the future

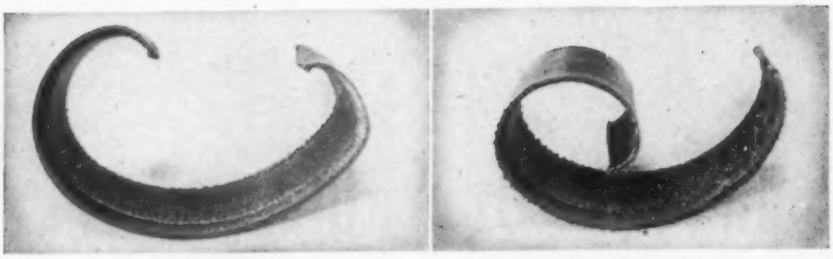


Fine finish on hard tool steel is obtained with a carbide-tipped flycutter ground and set to provide a 10° positive radial rake angle and a 0 axial rake angle, the cutting edge being ground to provide a 7° negative radial rake face about 0.010 in. wide

TO INSURE early, effective use of milling-research data in its own shop, Kearney & Trecker has established a Carbide Steel Milling Committee. The twelve members, selected from the engineering research, tool design, toolmaking, cutter grinding, methods, development engineering, sales and engineering - service departments, study each production milling operation in the plant. It is their task to evaluate conversion of the job to carbide. Studies are made of the adaptability of carbide milling techniques, the availability of suitable equipment, design of cutters and fixtures and potential economies. Recommendations are summarized and cleared through proper channels of the organization. If management gives a project the go-ahead signal, the C.S.M. Committee follows up the job until it is in successful operation and records the case history in a growing data file.

Several advantages are derived from a committee with personnel of diversified interests and activities. First, the group is qualified to advise any department that wishes to apply carbide milling techniques. Second, liaison is maintained between the committee and the engineering research staff. The latter has worked for years on the milling of steel with carbides and has developed techniques that can be applied to existing machines. Third, a well-rounded group working closely together is bound to develop original ideas of value.

Carbide milling of steel is a comparatively new technique—it is not yet possible to make "handbook" recommendations applicable to all steel milling operations. For this rea-



By locating the blade wedge in front of the cutter blade, as in the flycutter shown below, it is possible to study the effect of chip clearance contour on chip formation. Left—When the chip-clearance groove is improperly formed, chips may curve sharply at both ends and they often adhere to the cutter. Right—Properly formed chips are easily expelled from the cutter

son, the Carbide Steel Milling Committee developed a special adjustable flycutter. With this tool, trial cuts are taken to determine the proper rake, relief and clearance angles to be ground on the blades or teeth of carbide cutters to be used in the shop study. The adjustable feature permits varying the radial rake angle from 30° positive to 15° negative. The axial rake angle is constant at —7°, which has been found satisfactory for milling materials ranging from aluminum to steels of 400 Brinell hardness.

The adjustable flycutter has a wedge to hold a solid carbide blade in a slot milled in the cutter body. The wedge is placed in front of the blade, to permit study of the various contours of chip-clearance surfaces upon curling of the chip. This is not possible with a flycutter of conventional design. When the end of the wedge is beveled, the chips are generally formed in a double-six. Under certain conditions, a chip of this form will catch or "weld" on the cutter blade and ride with it until the tooth re-enters the work, resulting often in a broken tooth. But if a concave radius is milled on the end of the wedge, the chip is easily expelled from the cutter. Variations in the radius have no measurable effect on the power consumed while cutting.

Experimental work carried on by the C.S.M. Committee in connection with the milling of tool steel parts for dies and molds has resulted in another flycutter, which imparts a fine finish and often eliminates finish surface-grinding operations. This cutter uses a standard carbide-tipped toolbit held in the cutter body with setscrews. The bit is positioned to provide a 10° positive radial rake angle and a zero axial rake angle.

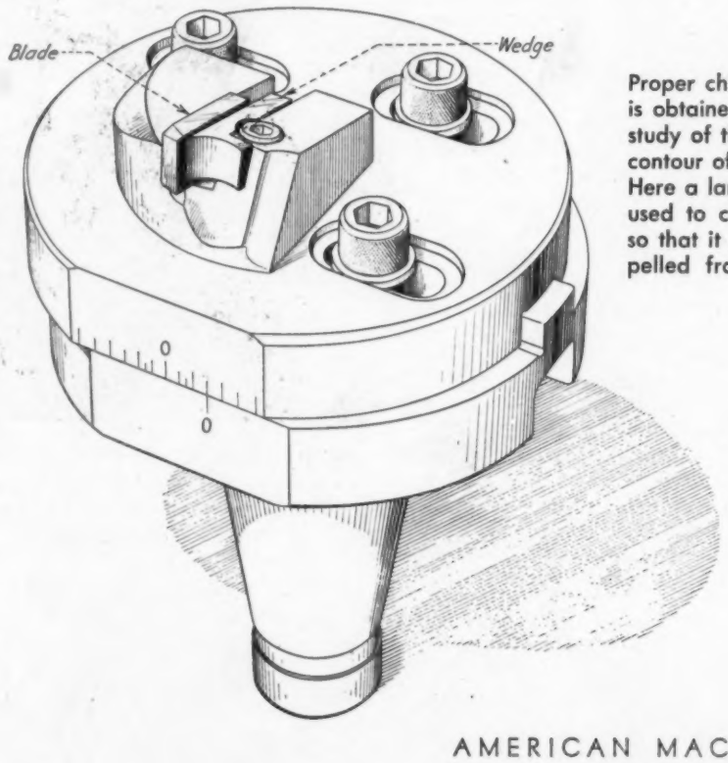
The face of the cutter is adjacent to the peripheral cutting edge is ground with a 7° negative rake angle to obtain a face approximately 0.010 to 0.012 in. wide. When machining oil-hardening tool steel, this cutter is run at 1,000 rpm., or 450 sfpm., and a feed of 7½ in. per min., or 0.0075 in. per revolution. Depth of cut is 0.125 in. when roughing and 0.030 in. when finishing.

Extensive shop tests disclose that there is no difference in performance of brazed and solid tips. Mechanically held, solid carbide blades have often been found more economical than brazed tips because the former are easier to reset and regrind, and have a longer useful life. When too short for mechanical clamping, they can be brazed to a shank.

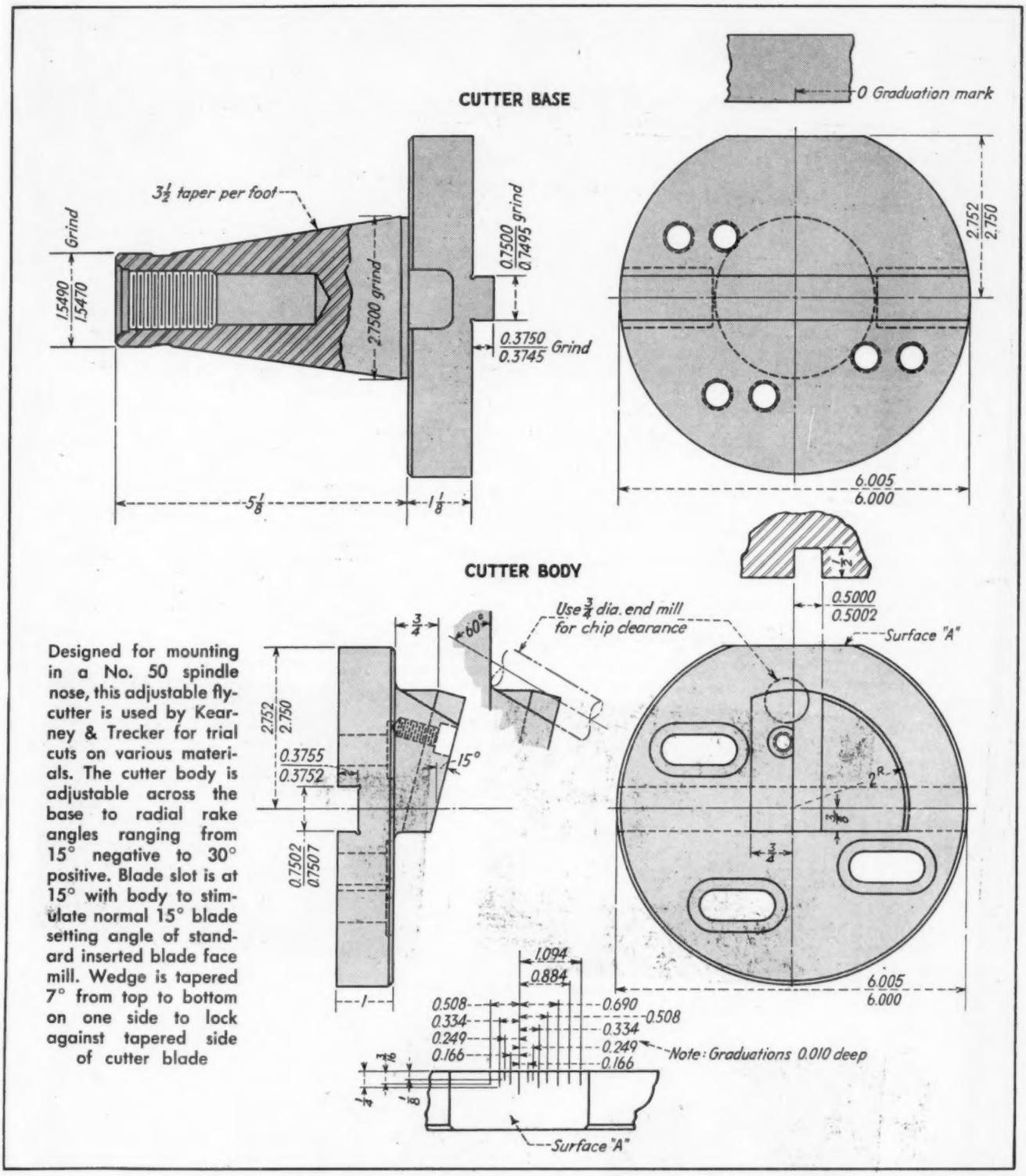
It will be asked why a positive radial rake is deemed best for milling steel, considering the publicity given to negative-rake milling. Let us go back to first principles. There is just one reason for using a negative rake angle on milling cutters, and that is to secure strength at the cutting edge. The negative rake angle places the cutting tip under compression, whereas with the positive rake angle the tip is stressed in tension.

Over the past 15 years, experience has shown that carbide is sufficiently strong to cut cast iron and nonferrous materials with positive rake angles. With steel the situation is different. The steel cutting grades of carbide have not been improved to the point where they have sufficient strength to mill steels with positive angles in the ordinary sense. Thus, while negative rake angles are inefficient, they are used on steel because the high compressive strength of carbide is utilized and more material is in line with the main cutting pressure. There is no magic in the technique of carbide steel milling. The negative rake angle has made the technique successful despite inherent inefficiency, because carbide is so hard it withstands the added abrasion and high temperature involved much better than would high-speed steel.

The milling cutter having a positive radial rake angle with a narrow negative radial-rake face at the cutting edge, as developed by the Kearney & Trecker research department, gives the added protection and strength to the cutting edge inherent in a negative rake angle, yet includes



Proper chip formation is obtained through a study of the front-end contour of the wedge. Here a large radius is used to curl the chip so that it is easily expelled from the tool



Designed for mounting in a No. 50 spindle nose, this adjustable fly-cutter is used by Kearney & Trecker for trial cuts on various materials. The cutter body is adjustable across the base to radial rake angles ranging from 15° negative to 30° positive. Blade slot is at 15° with body to stimulate normal 15° blade setting angle of standard inserted blade face mill. Wedge is tapered 7° from top to bottom on one side to lock against tapered side of cutter blade

the advantage of the more efficient cutting action of the positive rake angle. Such cutters were developed as a result of experiments in which special calorimetric apparatus was used to determine the power required by a milling cutter from the heat of the chips. These experiments have been reported at various meetings of the ASME and the ASTE by J. B. Armitage and A. O. Schmidt.

The data secured by the C.S.M. Committee in the Kearney & Trecker plant, as well as experiences of other firms, prove that this technique when properly applied on conventional machines, will produce important savings on straight face milling and certain types of slotting and straddle milling operations. Good results are obtained only when this type of carbide cutter is used on a machine in good condition and having adequate horsepower.

Since cutters having a 30° positive secondary radial rake angle gave excellent performance on mild steels and non-ferrous metals but were not as successful on the harder steels as cutters having 15° positive secondary

MACHINING REFERENCE DATA

KEARNEY & TRECKER CORPORATION — MILWAUKEE, WISCONSIN

Observation No. 42

Sheet No. 1 of 1 Sheets

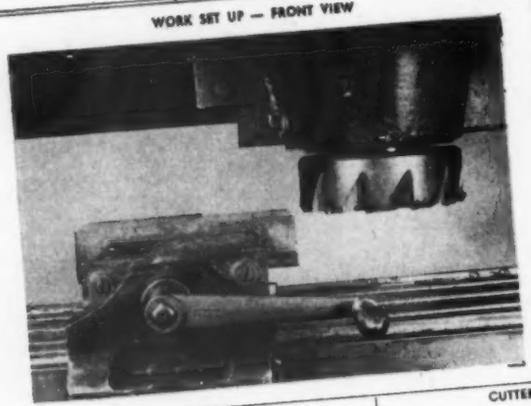
1. PURPOSE OF INVESTIGATION:

To determine cutter life of 15° positive radial rake angle face mill.

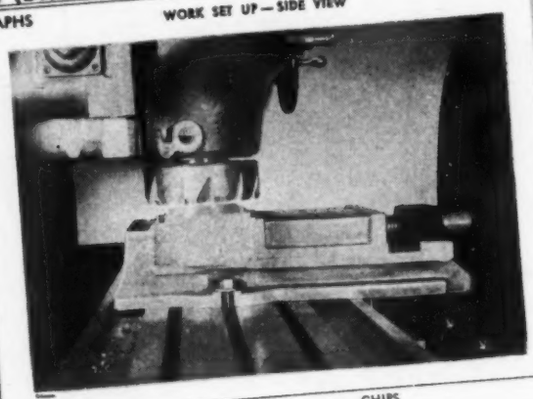
2. Part No. ---	3. Part Name Rough Billet		4. Operation No.
5. Operation Description: Mill face	7. Machine No.	8. Dept. and Mach. Center 20	9. Flywheel? Diameter Thickness — YES ☐ NO ☒
6. Type of Machine 5HM Vertical	11. Conventional Milling ☒ Climb Cut Milling ☐		12. Size of Arbor 1.875" "C" No. 50 Taper
10. Classification of Milling: End ☐ Form ☐ Face ☒ Slab ☐ Slotting ☐ Straddle ☐ Single ☐ Multiple ☐	15. Cutter Run Out	16. Cutting Time	17. Floor to Floor Time
13. Cutter Used— 10" Face Mill	14. No. of Blades 12		
18. Kind of Material NE-8022	19. Heat Treatment Specification	20. Hardness BHN-175	21. Shape of Material Rectangular
22. Spindle Speed 209 RPM	23. Surface Speed 547 Ft. Per Min.	24. Feed 0.100" Per Rev. 21 Inches Per Min.	25. Chip Load Per Tooth 0.0084"
26. Depth of Cut 0.125	27. Width of Cut 5.5	28. Length of Cut 12	29. No. of Cuts 155
30. Cubic Inches of Metal Removed 8.25 (Per Cut) 1280 (Total)			
31. Coolant ☐ Air Used ☐ None	32. No. Pcs. Per Grind 155	33. Finish Obtained Good	34. Horsepower: Spindle Motor 20 / Idle 4.9 / CUTTER Sharp, Max. 19.6 / Dull, Max. 24.8
35. H.P. Increase Per Cut	Cut No. 1 2 3 4 5 6 7 8 9 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235		
	H.P. Increase 19% (23.3H.P.)		10% (21.0 HP) (26% (24.8 H.P.)

PHOTOGRAPHS

WORK SET UP — FRONT VIEW

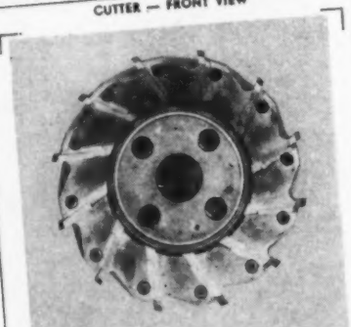


WORK SET UP — SIDE VIEW



CUTTER — SIDE VIEW

CUTTER — FRONT VIEW



CHIPS

A complete analysis of each milling job is made by the Carbide Steel Milling Committee. Trial cuts are made with the flycutter before developing a multiblade cutter. This form gives a complete case record

Contour of the chip-clearance spaces in a cutter body has a decided effect upon chip formation. Left—Insufficient radius caused metal to rub off the moving chips and to "weld" to the cutter body. Center—A chip is trapped because the chip clearance space is not shaped for smooth flow. Right—With correct contour, the curl of the chip closely matches the radius of the chip clearance slot. This cutter, used on steel, has the blades set at 15° positive radial rake, but a 12° negative radial rake face 0.020 in. wide is ground on the edge of each tooth

angles, it was believed that the secondary angle should be decreased as the hardness of the work is increased. However, experiments made with the adjustable flycutter indicate that the secondary angle is not critical. It is considered practical to standardize on a 15° positive secondary radial rake angle for cutters to be used on hard and soft steel, cast iron and non-ferrous metals.

Cutter bodies designed to hold the blades at a positive radial rake angle of 15° can be employed for a wide range of materials, providing the proper primary radial angles are ground on the cutting edges. Experience has shown that a steel cutting grade of carbide can be used for milling almost all materials, from aluminum to hard or tough steels, if the blade angles are correct. In most cases, a primary radial rake angle equal in width to about one and one half times the feed per tooth is sufficient. For aluminum, magnesium and cast iron, this angle should be approximately 6° positive. This angle is 5° to 10° negative for steel, depending on the hardness and analysis.

Kearney & Trecker has experimented with two methods of resetting the blades in the cutter body. When necessary to remove a cutter being used on a production milling job, the dull blades can be replaced with sharp blades and the milling operation continued. There are various ways of setting the blades so that the runout will not be excessive. One method consists of cutting a swath with a single blade and setting the remaining blades to the machined surface. In another procedure, an indicator is mounted on the milling-machine table while the cutter is revolved and each blade is set to the same dial reading.

There are objections to these methods of reconditioning cutters. Since it is not advisable to depend on the machine operator to replace the blades, he is forced to stand idle while a setup man locates the new blades. This operation involves greater machine down time, than would be required by replacing the entire cutter, thereby reducing the time available for actual production. Excessive time is consumed in changing the blades in a cutter while the cutter body is mounted on the milling machine spindle. For example, it is necessary, in the case of a 10-tooth cutter to remove 10 screws, 10 wedges and 10 blades; set in 10 new blades, replace 10 wedges and screws, at the same time being careful that no dirt lodges behind the wedges and that all blades are set out to the same diameter and without excessive runout on the face.

Experience indicates that it is quicker to remove the entire cutter and replace it completely. Also, experiments have been made with resetting the blades with the cutter mounted in a special fixture. Since a cutter can normally be resharpened about ten times before it becomes necessary to disturb the blades by setting them out, this method is little used. With an efficient cutter-grinding department equipped with modern cutter grinders, which use the cutter body itself as an excellent holding fixture while the blades are being resharpened, there is no reason to disturb the blade settings unnecessarily.

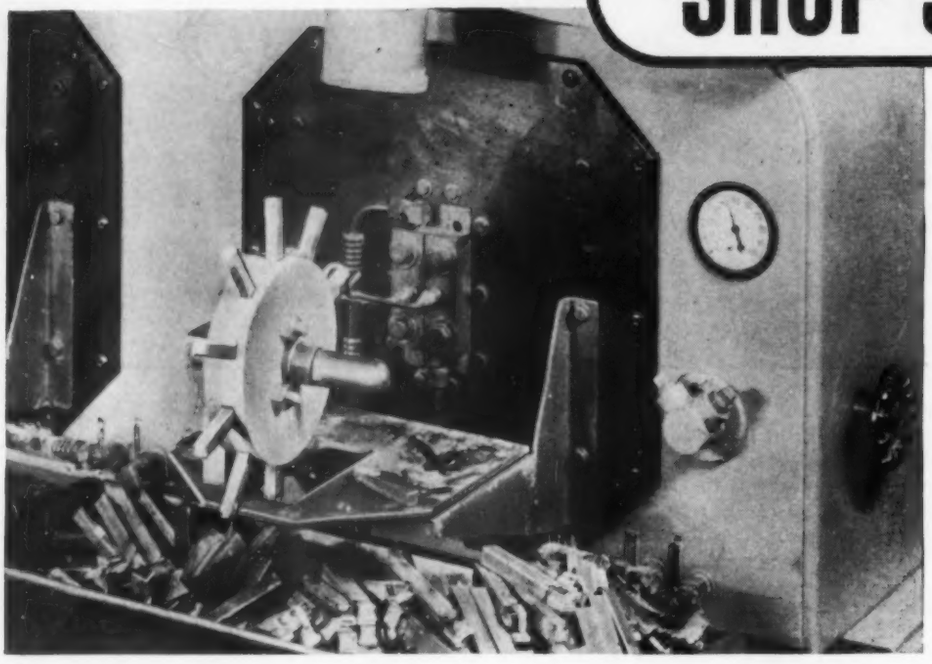
Of course each method has its merits. For example, grinding the blades separately on a surface grinder makes it easy for the average shop to get started in the carbide milling field. Heretofore, when a customer purchased a carbide cutter he was usually faced with the necessity of spending several thousand dollars for a rigid grinder, which was adaptable to grinding carbide cutters. This made many concerns hesitate about buying their first carbide cutters. On the other hand, the shop which has already been using carbide cutters on high production work to any extent can reduce milling-machine down time considerably by having at least two cutters for each operation so that the entire cutter can be quickly replaced and used while the dull cutter is being reground on a cutter grinder.

Coolant Ejects Stampings

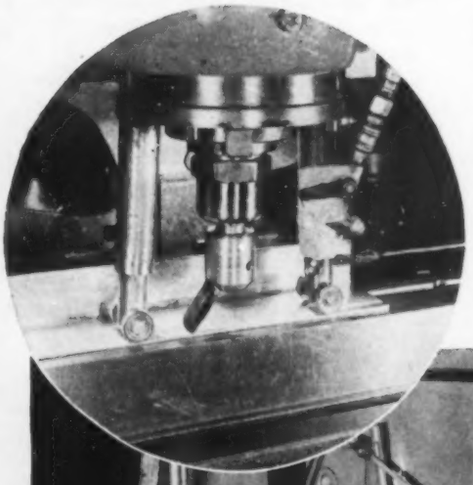
BY H. R. HAGEMAN

A PROPERLY directed stream of overflow lubricant or coolant can be used to eject formed parts from dies. This is particularly true of jobs where lubricant is required when hardstock is formed and cut progressively at high speeds. Washing the parts clear of the die saves the cost of an air ejector or mechanical ejector.

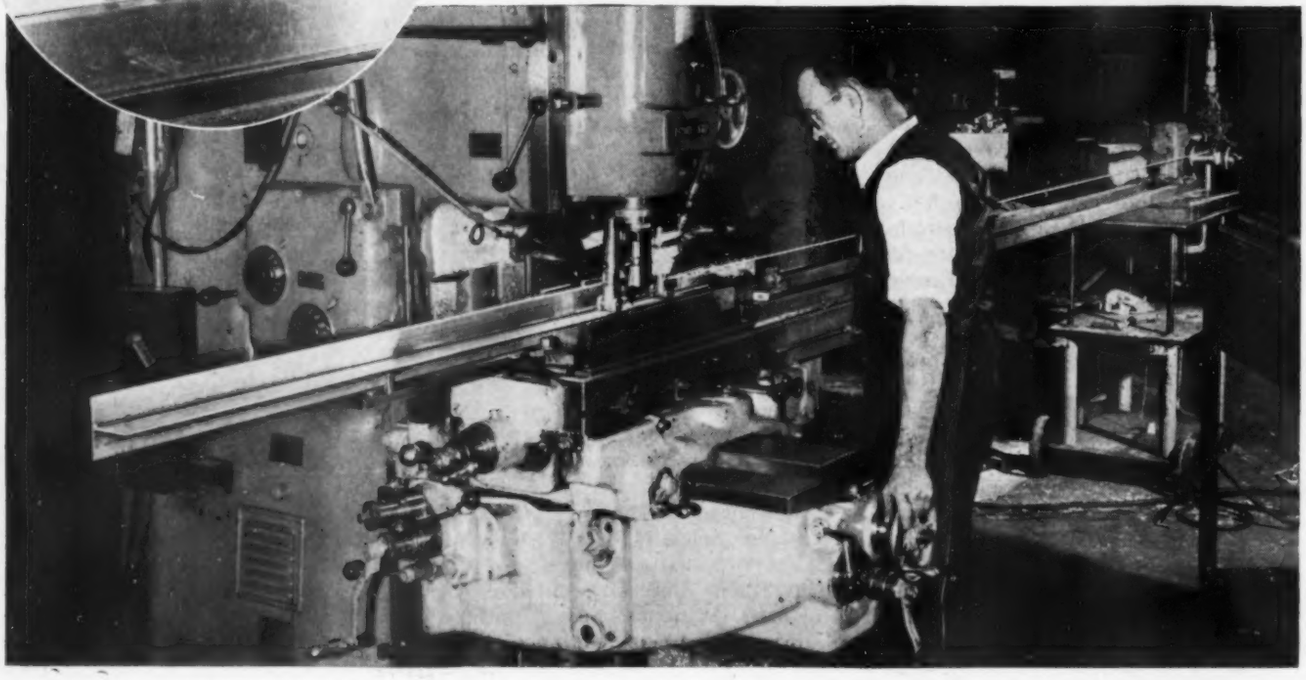
SHOP SHOTS

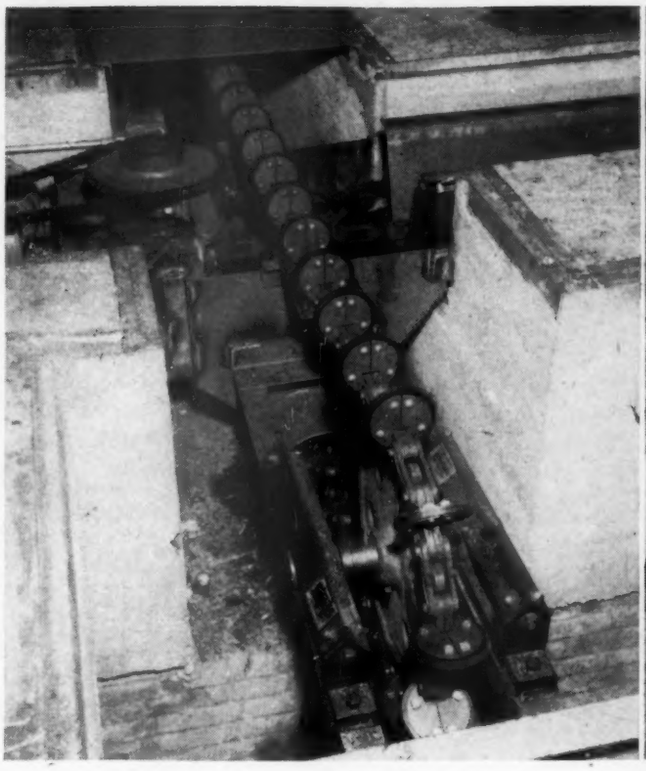


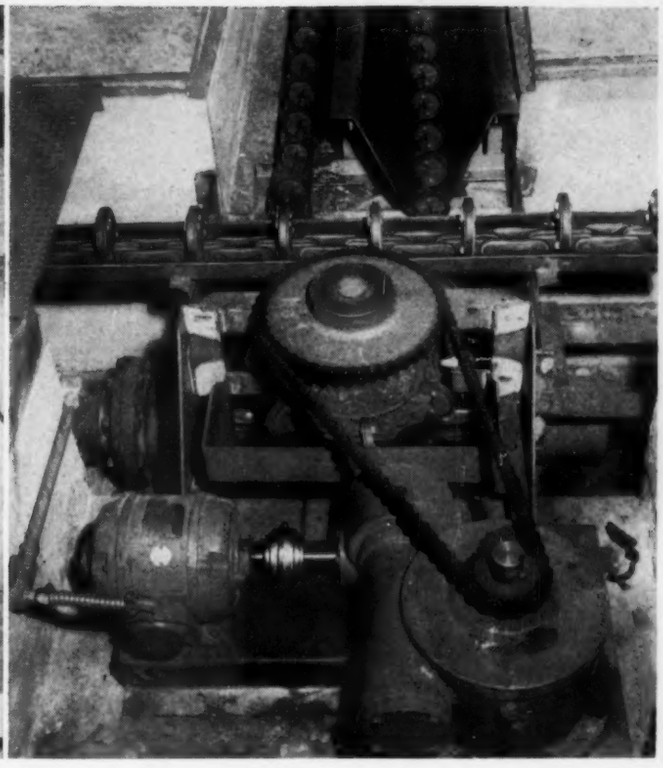
← **A rotary fixture,** held in place by only three bolts, may be quickly changed for induction brazing tool bits of varied sizes, and enables one operator to turn out high production. The fixture is a transite block, 6 in. in diam. with an 1½-in. face mounted on a revolving spindle attached to an upright support and having a capacity upwards of 20 tools, ranging in size from ¼ to ¾-in. square. An adaptor plate is used when changing to another size. Tools are held in the fixture by spring tension and released automatically after passing a horizontal line. *The Ohio Crankshaft Company.*



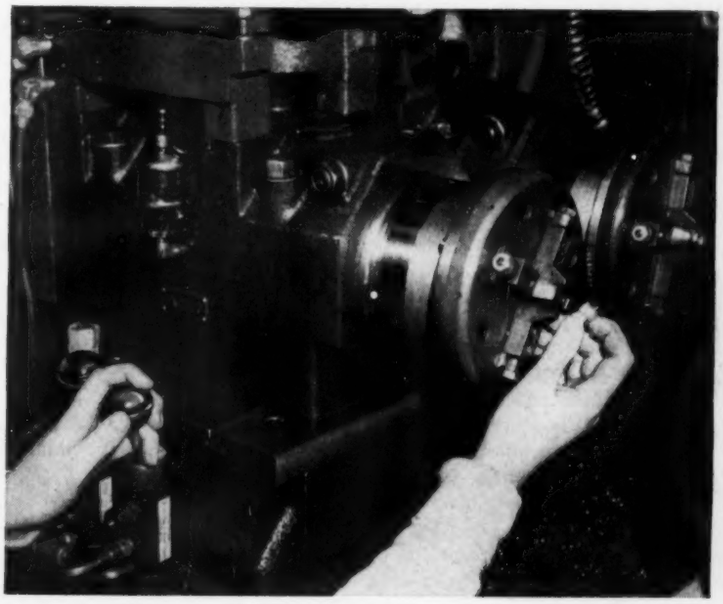
Milling 80-in. long extruded aluminum alloy T-sections was effected on a No. 3 Cincinnati vertical mill by providing a fixture plus a remote feeding device set in line with the mill table. The mill fixture contains a guide slot to permit milling either flange, a preloaded spring and roller unit to hold the T-section to one side of the slot and one outboard support. Two preloaded spring and roller units are mounted on the spindle quill to provide hold-down pressure sufficient to prevent chatter and at the same time permit the section to be pulled past the cutter. A feeding device, consisting of an air-drill motor coupled to a 64/1 speed reducer, clutch and a spool, is mounted on a small die truck attached to one end of the mill table by a piece of steel channel. Control of longitudinal feed at the operator's station is accomplished by running an airline from the air motor to the milling machine. ↓*Consolidated Vultee Aircraft Corporation.*





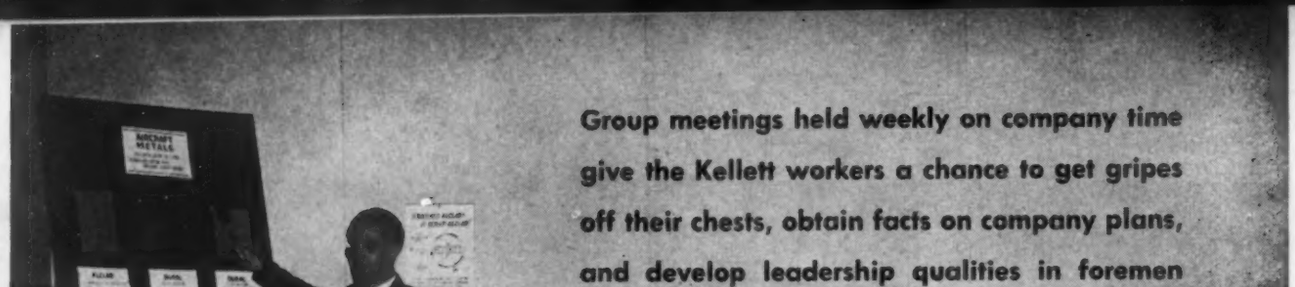


Closer grouping of machines was permitted and physical handling of steel particles eliminated by installation of a chip conveyor using synthetic rubber forcing disks as the feeding device. This setup extends 5000 ft. through departments machining cylinder blocks, cylinder heads and exhaust manifolds, and chips fall directly from 181 machines through the grating covering the conveyor trough. Conducting pipes range from 4 to 8 in. depending on the size of chips to be handled. Shown here is the take-up end of the main conveyor and a cross conveyor with transfer hopper; and a section of the return conveyor in a 6-in. open channel as well as one of the 4-in. feeder conveyor chains operating through an open trough and returning in a 4-in. open channel. *Packard Motor Car Company.*



Diaphragm chucks, opened by air pressure and individually controlled by two knobs on the side of the machine, expedite internal boring of short parts. A small plunger in the center of each chuck enables the short parts to be readily removed after the operation. When the air pressure is applied to open the chuck, the spring-operated plunger kicks the part out of jaws into the operator's hand. *N. A. Woodworth Co.*

Steel fixtures, held on magnetic chucks, readily retain non-magnetic Stellite alloy milling-cutter insert blades for grinding operations. When small lots of bits, blades or special shapes are to be surface ground they may be best held in a steel ring by pouring sulphur around them. *Haynes Stellite Co.*



Group meetings held weekly on company time give the Kellett workers a chance to get gripes off their chests, obtain facts on company plans, and develop leadership qualities in foremen

Employee Forums on Company Operations

A RAPID, two-way flow of ideas, information, criticism and suggestions between individual employees and top management characterizes the cooperative meeting system operated at the Kellett Aircraft Corporation's Philadelphia plants. It represents Industrial Relations with a purpose —a common ground for workers and company officials to work, with a better understanding of each others problems.

The plan of holding departmental meetings is not new by any means, but some of the adaptations worked out by Kellett supervisors have brought significant results. The company introduced the plan at the height of war production more than two years ago when its personnel numbered close to 3,000. War contract cancellations and cutbacks have reduced the number of employees tc 600 but have not lessened by any degree the regularity of weekly group meetings.

Shop supervisors schedule meetings in advance, after consulting with their foremen, and copies are forwarded to supervisors and executives. The employees attend the half-hour meetings on company time and during the work day. All employees have an opportunity to bring their problems to the attention of their superior officer and, through him, to the top management.

When a foreman conducting the meeting is unable to answer a question, he is charged with the responsibility of obtaining and giving the answer by the next week. No question, regardless of how trivial, goes unanswered, thus the employee is enlightened by the time the next meeting rolls around.

The meetings afford employees a chance to get gripes "off their chests" and give the foreman an opportunity to learn what is on the minds of his subordinates and to place his ideas before them. Furthermore, the foreman's leadership is developed. He is required to plan, conduct and prepare written minutes or reports on meetings. He cannot sidestep the responsibility of seeing that all issues raised are treated with consideration.

Facts Replace Rumors

During wartime operations, the plants were on a three-shift basis and schedules of meetings were set up for each shift. An examination of reports filed during those hectic production days indicates those attending meetings shortly after midnight were just as enthusiastic in their forum discussions as those on the earlier shifts.

Rumors—those insidious messengers that travel faster than sound and leave a trail of confusion in their wake—can be stifled rapidly by means of the cooperative meetings. On this score, Kellett executives believe in keeping their employees fully informed on company projects. For example, a rumor circulated that Kellett had mergcd with another company. The report was false and the employees were so advised immediately. Another rumor based on "inside information" indicated the company was moving to Long Island. This rumor was likewise scouted forthwith through cooperative meetings.

A few months ago, however, the firm was negotiating for a plant removed by some 22 miles from Philadelphia and group leaders kept their subordinates advised of the plans at each meeting. As a matter-of-fact, a survey was conducted at each of the meetings one week and the company, virtually overnight, knew just how many employees planned to continue working if and when the move took place, and what problems, such as transportation, confronted them.

Irvin Stander, head of the Employee Services Department, supervises operation of the cooperative meeting plan and reports directly to Robert J. Riddle, manager of the Industrial Relations Division. He serves as a coordinator and prepares weekly bulletins of subjects for foremen to discuss. The subjects are only guides, however, and the foreman is free to reject them in favor of some topic he considers more timely for his group, unless the company announcement is of sufficient importance that it is marked "Must."

The suggested subjects do give the foremen a talking point, however,

and assist him in preparing a discussion program. The company finds that the meetings are more effective if the foreman does the talking for the first 15 min. and then opens the remaining 15 min. to round-table discussion. The sessions are informal and the employees don't hesitate to speak their minds. Personal complaints are restricted to items that cover all other employees. There are other company avenues for the individual gripes of an employee.

Out of the meetings have come some valuable suggestions. The originators are advised to forward their ideas to management via the Suggestion Plan which is apart from the cooperative meetings. In this way, the employees get recognition and the monetary reward their suggestion warrants.

In this connection, one meeting was devoted to the subject "Scratched Metal May Become Scrap Metal." It involved the waste arising from scratches on Alclad and anodized aircraft parts. Scratched sample parts were exhibited to show the promotion of corrosion and consequent breaks and failures of the metal under stress. A wave of employee suggestions on preventive measures poured forth and the meetings contributed to a marked reduction in scratched metal.

Reconversion Data Given

The theme of another meeting during the reconversion period was aptly termed "What's Cooking," and gave a detailed factual report on progress of the reconversion program, including new contracts received, those pending, contracts lost and the reason for it. In addition, efforts of the Contracts Division to obtain new business on a carefully planned program were outlined. No details were spared and several foremen interviewed recently said the "concrete information" on business ahead helped immeasurably in giving many employees peace of mind.

W. L. Wilson, vice-president, who was instrumental in establishing the system, prepared a series of forms enabling foremen to get action on matters brought up at cooperative meetings. One form involves tool or machine maintenance repair; a second deals with changes in physical facilities; and a third involves all other requests, such as items referring to new tools or tool improvements and safety suggestions. Foremen receive complete instructions on the proper points to forward the forms.

Not all requests are granted, but the employee receives a reason for the negative action. For example, an employee requested at a weekly meeting that a guard rail be placed at the end of a hydropress. The following week he was advised, "Guard rail at end of hydropress has been suggested numerous times. This area is required for aisle and cannot be blocked by a railing."

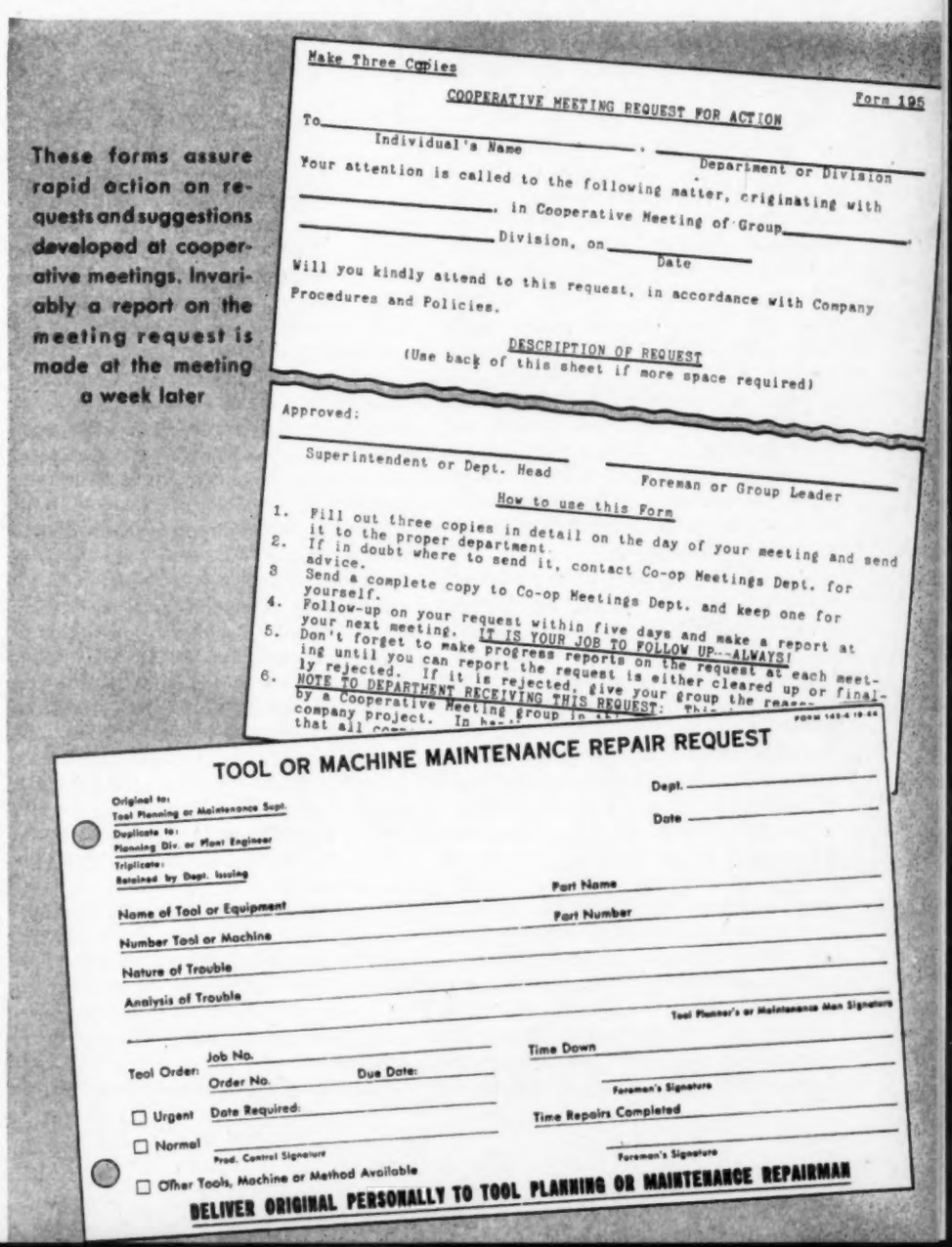
A discussion at a session of the experimental wood shop group led to a request for installation of safety guards over belts on the shop rip saw, planer, jointer and shaper. This request was granted and work orders issued immediately. A meeting of the cowl shop group brought out the fact that no electric lines were grounded and several men had received shocks. The following week the group learned arrangements were made to ground the equipment and the date work would be completed.

Such items are typical of the speed with which questions are answered and requests granted or denied. Employees feel free to ask their foremen questions they would never dream of asking top management direct. If an executive drops into a cooperative meeting, as they frequently do, it doesn't mean necessarily that he is going to make a speech. The meeting remains informal and the men are just as free in their discussions.

Groups within the engineering division are represented by a coordinating committee, which meets monthly. These groups are small enough that important information can be passed along rapidly.

The cooperative meetings are an accepted Kellett operation today and there is no slackening in the interest of employees. In the words of Mr. W. W. Kellett, president, "They are a major factor in making us a closely knit organization."

These forms assure rapid action on requests and suggestions developed at cooperative meetings. Invariably a report on the meeting request is made at the meeting a week later



Make Three Copies

COOPERATIVE MEETING REQUEST FOR ACTION

Form 195

To _____ Individual's Name _____ Department or Division

Your attention is called to the following matter, originating with _____, in Cooperative Meeting of Group _____, _____ Division, on _____ Date

Will you kindly attend to this request, in accordance with Company Procedures and Policies.

DESCRIPTION OF REQUEST

(Use back of this sheet if more space required)

Approved:

_____ Superintendent or Dept. Head

_____ Foreman or Group Leader

How to use this Form

1. Fill out three copies in detail on the day of your meeting and send it to the proper department.
2. If in doubt where to send it, contact Co-op Meetings Dept. for advice.
3. Send a complete copy to Co-op Meetings Dept. and keep one for yourself.
4. Follow-up on your request within five days and make a report at your next meeting. IT IS YOUR JOB TO FOLLOW UP--ALWAYS!
5. Don't forget to make progress reports on the request at each meeting until you can report the request is either cleared up or finally rejected. If it is rejected, give your group the reason.
6. NOTE TO DEPARTMENT RECEIVING THIS REQUEST: This ... by a Cooperative Meeting group in ... company project. In ... that all ...

FORM 195-A 10-44

TOOL OR MACHINE MAINTENANCE REPAIR REQUEST

Original to: Tool Planning or Maintenance Supt.
Duplicate to: Planning Div. or Plant Engineer
Triplicate: Retained by Dept. Issuing

Dept. _____
Date _____

Name of Tool or Equipment _____ Part Name _____
Number Tool or Machine _____ Part Number _____
Nature of Trouble _____
Analysis of Trouble _____
Tool Planner's or Maintenance Man Signature

Tool Order: Job No. _____ Order No. _____ Due Date: _____
Time Down _____
Foreman's Signature

☐ Urgent Date Required: _____
☐ Normal _____ Prod. Control Signature
Time Repairs Completed _____
Foreman's Signature

☐ Other Tools, Machine or Method Available

DELIVER ORIGINAL PERSONALLY TO TOOL PLANNING OR MAINTENANCE REPAIRMAN

Facts the Thread Supervisor Should Know

BY H. SCHLARMAN
JONES & LAMSON MACHINE COMPANY

Chaser performance depends in part on the tools themselves and in part on external conditions under the control of the user

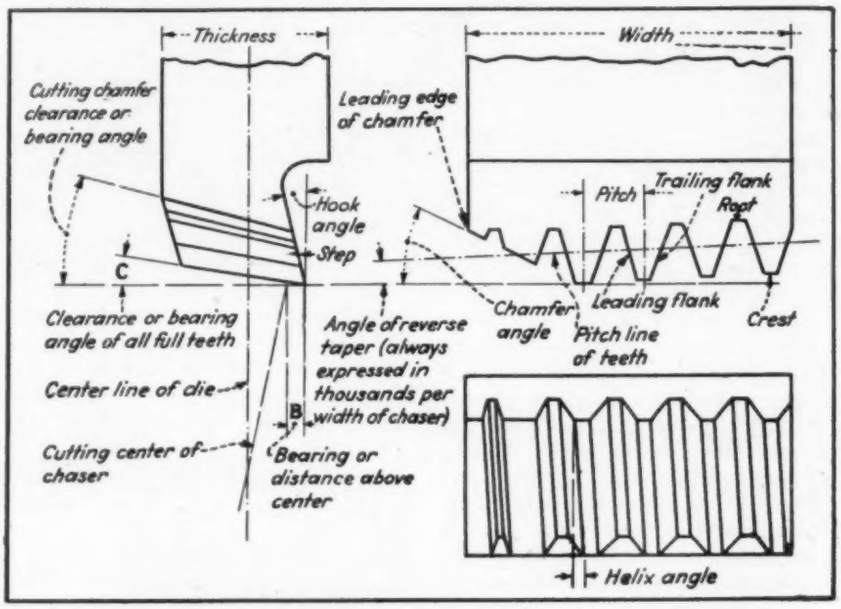


Fig. 11—Nomenclature commonly used in connection with a chaser

THE FOLLOWING information on the manufacture of chasers is given only to provide a fundamental knowledge of those factors that go into the chaser thread to produce a threaded product. The user should not get the idea it is necessary to check all his chasers as a general practice.

Correct manufacturing and checking of the chaser is the manufacturer's responsibility. The user has neither the time, knowledge nor equipment to check chasers properly. Furthermore, the user's interest lies not in how the chaser checks, but in the threaded product produced by the chaser. The user is responsible for conditions external to the chasers, such as alignment, speed, lubrication and resharpening, which influence their action.

When it has been found that all external conditions are correct and the trouble still exists, a check of the chasers is helpful if proper equipment is available. Checking should be done, preferably by the manufacturer's representative.

Chaser threads may not necessarily check the same as the product thread. For example, on many pitches the chaser tooth form may differ from the true or basic thread form. This is because the manufacturer has compensated on the thread form to allow for helix and hook. If these allowances were not made and the true thread form were put on the chaser teeth, the chasers might not produce the correct thread form on the work.

There are other compensations the manufacturer may make which in themselves may seem wrong to anyone not knowing all the factors entering into their calculations, but which are essential in the chaser to produce a correct thread. If all the external factors, controllable in the user's shop, have been checked and found correct and the trouble has been traced down to the chaser itself, the only common-sense action for the user is to send the chasers back to the manufacturer for check.

Users should not try to recondition chasers that have been made wrong. Even the manufacturer generally finds it easier to make a new set of chasers rather than recondition a set that has been made wrong.

A user who attempts to recondition a chaser removes responsibility from the manufacturer to himself. Invariably a user will ruin what good there is in a chaser when he tries to lap or recondition it by any other means. When this user-reconditioned chaser is returned to the manufacturer, the maker cannot check the chaser as originally furnished to see if it was made wrong or used wrong. Attempted reconditioning of chasers in the user's shop is troublesome and unprofitable for both him and the manufacturer.

Chasers are usually made of high-speed steel. Once in a while chasers may be made of carbon steel for materials such as spongy abrasive copper. On materials such as this, carbon-steel chasers will hold their edge longer.

The hardness of chasers is kept to a Rockwell reading of C 61 to 64 on U. S. form coarse and fine pitches. On about 6-pitch and coarser, and on coarse Acme form chasers, the hardness may be less, running from about C 59 to 61.

In the chaser teeth themselves, there are seven factors that should be considered. These are thread form, pitch, helix angle, clearance and bearing of full teeth, spacing and reverse taper. These factors must be manufactured into the chasers. There is little or nothing the user should or can do to correct errors in them.

The radial chaser, because it has more factors that cannot be varied by the user to suit the needs of the job, is the most difficult for the user to handle properly. The radial chaser will therefore be used in explaining the factors entering into the manufacture of a chaser.

The thread form of a chaser does not have to, and in many cases (particularly in coarse of Acme threads) may not, conform to basic thread-form measurements. This is because the helix of the thread and hook ground on the lip of the chaser both affect thread form. These factors become increasingly important with increasing coarseness of pitch, which means greater depth of thread.

The root and crest of a chaser thread form are made narrower than basic width. The root of the chaser thread should be sharp enough to clear the basic outside diameter of the stock. The crest of the chaser thread should be sharp enough to clear the basic root of the thread cut.

The limits on the sharpness (greater than basic) of the crest and root of the chaser threads varies somewhat with the different manufacturers, dependent on the method used to machine the chaser teeth. There are, however, definite limits specified by the Screw Thread Commission Handbook.

The limits on tooth form cannot be held as close on a milled or hobbed and hardened form as on a tooth form ground after hardening.

PITCH: The pitch of the chaser thread is the same as the basic pitch of the thread.

HELIX ANGLE: The helix angle of the chasers may not always be the exact helix angle of the thread. If external conditions cause the chaser, with normal helix, to cut too long or too short in lead, the helix on the chasers may be varied to compensate these tendencies and make the chasers cut with a correct lead.

Whereas the functions of thread form, spacing, pitch and helix angle are to produce accuracy, the functions, clearance, bearing, and reverse taper, have to do with the correct cutting action of the chaser.

Any chaser, cutting straight thread and depending on itself to control lead, should cut only along the chamfer up to and including the first full tooth. All teeth back of the first full tooth should not do any cutting whatsoever. They should merely ride in the thread already formed by the chamfer and the first full tooth, to control the relation (lead) of the threads being formed with the first thread already formed. When the chaser teeth back of the first full thread are allowed to cut, they start to recut the thread form just produced by the chamfer and the first full tooth.

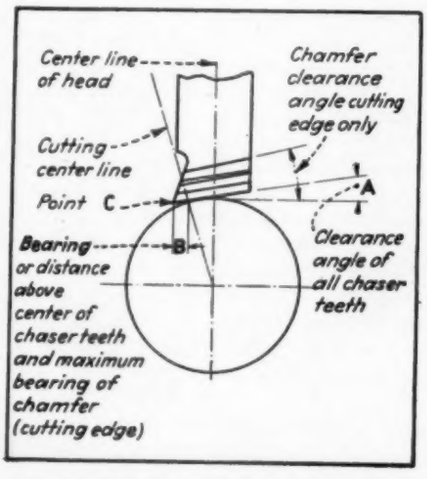

Center line of head
Chamfer clearance angle cutting edge only
Cutting center line
Point C
A
B
Bearing or distance above center of chaser teeth and maximum bearing of chamfer (cutting edge)
Clearance angle of all chaser teeth

Fig 12—Clearance angles and bearings of a radial chaser

Before going further, it would be well to study Fig. 11 and become familiar with chaser nomenclature.

Clearance and bearing will be discussed together. Clearance of the chaser teeth is shown in Fig. 12 by angle *A*. Bearing is the distance that the edge of the chaser teeth are ahead of the theoretical cutting center of the diehead. See *B*, Fig. 12.

Although "ahead of center" was used in the preceding paragraph, the expression "above center" is also common. Both will be used hereafter.

Clearance and Bearing

There are three terms used to designate degree of bearing:

1. Correct bearing—this is self-explanatory.
2. Heavy bearing—when Point *C* is too much above center.
3. Light bearing—when Point *C* is not enough above center.

There are two clearances and consequently two bearings on a chaser.

1. The clearance and bearing of the *chaser teeth* (discussed in this article).
2. The clearance and bearing of the *cutting chamfer* (discussed in an article on chaser sharpening).

The correct clearance is an extremely important factor in radial chasers. The clearance of the chaser teeth would not be so critical if it were not for the fact that it is necessary to grind a chamfer clearance on the chaser teeth to achieve a cutting edge for the chaser. The bearing on the chaser teeth should be equal to or a few thousandths heavier than the absolute maximum bearing at which the chaser teeth would cut. In this way the unchamfered non-cutting teeth are forced to act as guide teeth to maintain lead.

The purpose of all the chaser teeth, beyond the first full tooth adjacent to the chamfer, is merely to ride in the first full thread produced by the chamfer and the first full tooth, in order to control the relation or lead of the threads being cut with the threads already cut.

To get a clearance and bearing heavy enough so that the back chaser teeth would guide without cutting, would be simple if it were not for the fact that this clearance and bearing

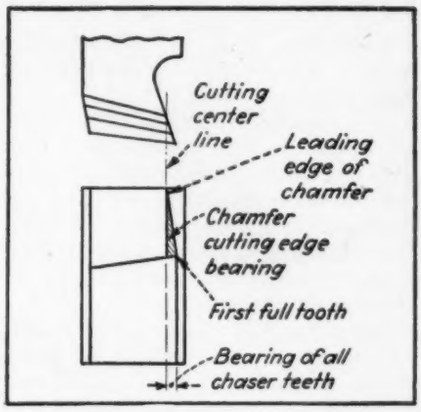


Fig. 13—The plane of chamfer intersects the chaser hook to give a gradually increasing cutting-edge bearing

is the base on which the chamfer clearance and bearing is ground. When the chamfer clearance angle is ground on the chaser teeth a cutting edge is produced that runs at an angle both to the horizontal and vertical planes.

The bearing of this cutting edge will be the result of the chamfer clearance angle cutting into the hook angle of the step. At the leading edge of the chamfer, Fig. 13, the bearing is the lightest and may even be below center. It gets heavier as it approaches the first full tooth.

The bearing of the cutting edge increases to the bearing of the chaser teeth, Fig. 13. If the chaser teeth bearing is too heavy, the chamfer cutting-edge bearing will be too heavy and many troubles will result. If the chaser teeth bearing is too light there will be as much and even more trouble than with a heavy bearing as the chaser will chatter.

The user can lighten the bearing of the chaser teeth, but he cannot make the bearing heavier. The user cannot change the clearance angle of the chaser teeth. This is put into the chaser when the teeth are milled or ground into the chaser. The chaser-teeth clearance angle will vary with the diameter and pitch as well as with thickness of the chaser and the position of the chaser in the diehead relative to the center line.

The diehead and the whole chaser must be so designed that a chamfer cutting edge of the strongest cross-section is produced when the chamfer clearance is ground on the chaser teeth to produce the cutting edge. If there is too great a difference between the chaser teeth and chamfer clearance angle, a chamfer cutting edge would be produced of such thin

cross-section that it would chip quickly and have to be resharpened frequently.

The bearing of the chaser teeth is dependent mainly on the pitch and diameter of the thread combined with the consideration of the effect of the chamfer clearance angle. Because bearing is important in cutting action, it may have to be varied because of the screw material.

Although the chaser-teeth clearance angle can be pretty well computed from the physical dimensions of diehead, chasers and thread to be cut, the most efficient bearing often has to be found by trial and error.

Spacing is extremely important in producing correct thread form on the threaded part. The teeth on each chaser are set over an amount equal to the advance of the thread in the number of degrees that the chaser is from the No. 1 chaser. Setting over causes the chasers to track (follow) directly on the line of helix.

If there were only one chaser, spacing would be unnecessary. However, since usually four and sometimes six chasers are used in a set, it is imperative that all the teeth on each chaser should be spaced over the right amount, relative to its position in the circumference of the diehead.

Figuring the spacing is extremely simple. For example, let us take a set of four chasers of 20 pitch. (Diameter does not influence spacing.) Since we have four chasers in the set, they will be spaced at 360°/4 or 90° to one another, or at the quarter points of the circle. See Fig. 14. The decimal pitch of 20 threads to the inch is 1.000/20 or 0.050 in., the amount the thread will advance (pitch) in one revolution.

Let us consider four chasers having only one thread tooth on each, Fig. 14. No. 1 chaser would start the thread. No. 2 chaser would be a quarter of the way around the circle, and the thread would have advanced a quarter of the pitch 0.050/4 or 0.0125 in. Therefore the tooth on No. 2 chaser, in order to track with No. 1 chaser, would have to be spaced over 0.0125 in. in the direction of the helix.

No. 3 chaser would be halfway around the circle and would, therefore, have its thread tooth 0.050/2 or 0.025 in. from No. 1. No. 4 would be three-quarters around the circle and therefore its thread tooth would be ¾ x 0.050 or 0.0375 from No. 1.

The spacing of the chaser teeth on all the chasers in the set is positioned relative to the rear locating chaser surfaces in the axial direction. For simplicity Fig. 14 shows spacing from the leading edge of the chaser. It can be seen that the finer the pitch the more critical is the spacing.

Off-spaced chasers produce a wide groove and a thin thread because, not tracking exactly in the same path of the helix, the teeth cut a groove as wide as the sum of the off-track to the right and left of the proper helix line or track. See Fig. 15.

On some types of dieheads off-spacing may show as steps in the thread form of the piece cut. If off-spacing is bad enough it sometimes can be seen in the chamfer cut of the threaded part, Fig. 16.

Fortunately, off-spacing is not a trouble often experienced by the radial chaser user. If he does run into this trouble, there is little he can do about it on the majority of dieheads, since by correcting this he may destroy some other factor important to the correct cutting action.

Off-spacing, when it occurs, is most likely found in plain milled or hobbed and hardened chasers. It rarely is found in ground-thread radial chasers. The sum of the errors, both to the right and left of the absolute helix, among all the chasers in the set should not exceed 0.001 in. to give an accurate form.

Reverse taper is not a factor of pipe or taper cutting chasers. It is, however, an important factor in the performance of chasers for cutting straight threads. Any reference, hereafter, to reverse taper, will therefore be in connection with chasers for cutting straight threads.

Reverse taper is the amount of greater distance the pitch line of the last tooth of the chaser is above the first tooth from a line parallel to the axial centerline of the diehead. In other words, the amount that the pitch line of the last tooth is higher than the pitch line of the first tooth.

There are two expressions used when referring to reverse taper:

1. Positive Taper. See Fig. 17.

This is the correct kind. It is when the pitch-diameter line of the last tooth is higher from the axial centerline of the die than the pitch-diameter line of the first tooth.

2. Negative Taper. See Fig. 17.

This is the wrong kind. It is when the pitch-diameter line of the last tooth is equal or nearer to the axial centerline of the die than the pitch-diameter line of the first tooth.

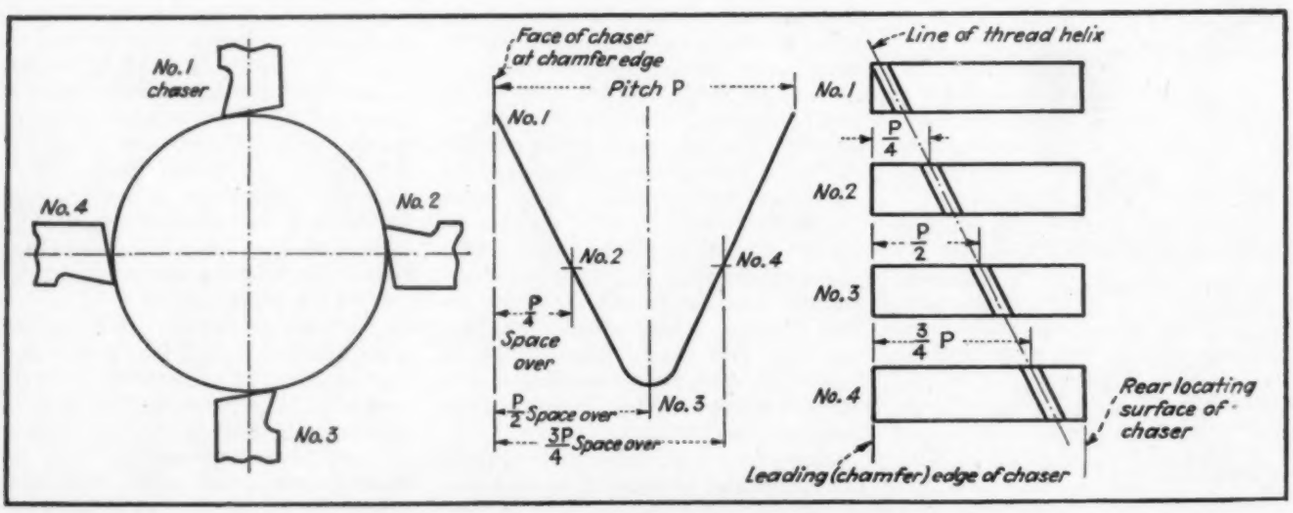


Fig. 14—A set of chasers having only one tooth is pictured to show the advance needed for the thread to track correctly

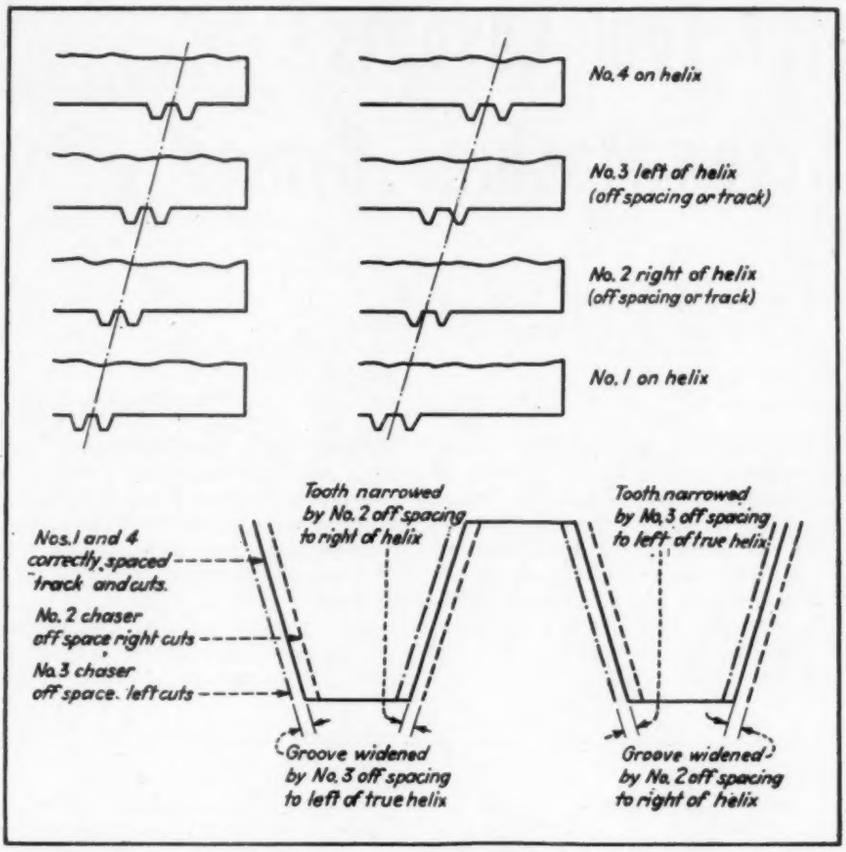

No. 4 on helix
No. 3 left of helix (off spacing or track)
No. 2 right of helix (off spacing or track)
No. 1 on helix
Tooth narrowed by No. 2 off spacing to right of helix
Tooth narrowed by No. 3 off spacing to left of true helix
Nos. 1 and 4 correctly spaced track and cuts.
No. 2 chaser off space right cuts
No. 3 chaser off space. left cuts
Groove widened by No. 3 off spacing to left of true helix
Groove widened by No. 2 off spacing to right of helix

Fig. 15—All teeth (top left) track on the helix when the spacing is correct, producing an accurate tooth form having spacing and teeth of equal width. Off-spacing (right) produces the wrong thread form with wide spacing and narrow teeth

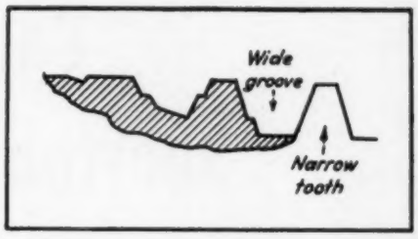


Fig. 16—How excessive off-spacing would narrow the tooth form and show on the chamfer cut (exaggerated)

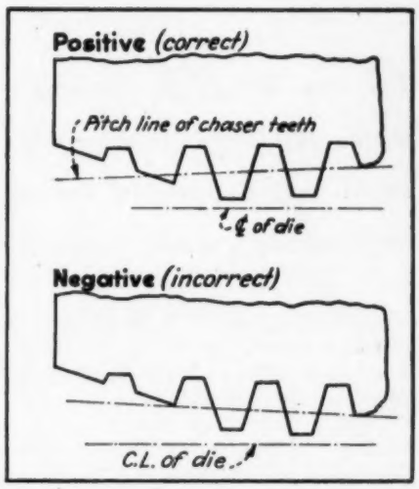


Fig. 17—Exaggerated view of positive (correct) and negative (incorrect) reverse taper indicates that a slight relief is obtained with the former

The correct amount of reverse taper is absolutely essential to make a chaser cut a straight thread without taper. The theoretical definition of a straight thread is a thread on which the pitch diameter at the end of the thread is the same as at the start.

However, if the taper in die-cut threads of normal length is within 0.001 in. and the other factors of the thread are correct within limits so that the thread will pass the gages, the thread is loosely referred to as a straight thread.

The amount of correct positive reverse taper of a chaser is not something that can be figured out mathematically. It has to be found by trial and may be as little as 0.001 in. for the cutting action required.

Thread pitch and diameter, as well as width of chaser, affect reverse taper. Sometimes also, it may be necessary to vary the reverse taper to suit the material on which the thread is cut.

The effect of positive reverse taper can be described as a gradual decrease in contact pressure between the full chaser teeth and the thread cut. The presure is greatest at the first full tooth adjacent to the chamfer and becomes gradually less towards the back of the chaser.

Correct reverse taper is necessary for a number of reasons that can be easily understood. A chaser with negative reverse taper can do nothing but cut a taper thread.

Heat is generated when material is cut, causing slight expansion. This tied in with the friction caused by the rough sides of the thread, would not only cause taper but would set up such a pressure as to break out the teeth if the proper amount of clearance was not allowed to take care of these conditions. Positive reverse taper is also necessary to take up the necessary allowable sliding clearance between the chaser or chaser holder and the slot in which it works.

Because the chaser or chaser holder must move, there must be some clearance between these and the slot. When the chaser chamfer starts to cut, the pressure tends to push the chaser back against the diehead. However, as soon as the full teeth engage the thread, the tendency is to pull the chaser in the opposite direction, or towards the front. If there were no positive reverse taper in the chasers, there would be no clearance for the forward rocking action of the chaser, and there would be what amounts to negative reverse taper. As stated before, this would cause tapered threads and excessive chaser wear and breakage.

Correct reverse taper in the chasers can be nullified if there is too much clearance or play between the chaser or holder and the slots in which they work. Too much positive reverse taper is almost as bad as none at all, as it allows so much clearance between the thread and the full or guiding teeth that they lose the contact necessary to function. This results in tapered, offlead, drunken and sometimes chattered threads.

Negative reverse taper causes a hard cutting action, while too much positive reverse taper causes too light a cutting action to maintain an accurate thread.

With the exception of the clearance angle of the chaser teeth, which is not in the design of the tangent or circular chaser, the foregoing remarks apply to these types as well as to the radial chaser.

Careful Tool Layouts Shorten Screw-Machine Cycles

BY A. AINSWORTH
THE McKINNON INDUSTRIES, LTD.

The case history for turning a simple part serves to show what sound tool engineering can do in promoting machine economies

SECONDS of cycle time on screw-machine operations are magnified into an important element of shop cost by the large quantities usually involved in such work. For this reason tooling layouts for screw machines deserve a lot of thought. Those described here were purposely selected to show the results obtainable by concentrated tool design effort.

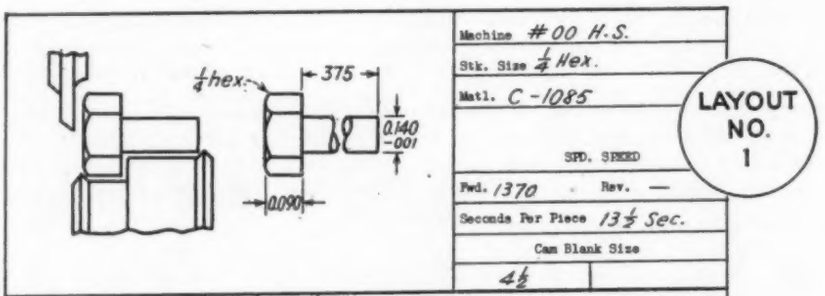
Good tool design depends on a combination of ingenuity and attention to detail. Each setup demands that full attention be applied to the requirements of the product to obtain the best cycle time and tool life. The layouts given here form a progression that passes through some simple arrangements, but each builds up toward a goal—tool design for savings.

LAYOUT NO. 1—Least possible design effort has been expended. Granted it will do the job, but the tooling gives little aid to the shop man who faces the problem of machinability. Down time for tool grinding would be at a maximum because of the 0.001-in. tolerance on the formed diameter. Scrap would be high, and machine wear on the cross-slides would be heavy. The design principle of this layout may be compared to a turret-lathe setup where the front and back cross-slides could only be used individually. The possibility in an automatic of combining the working of the turret, front cross and rear cross-slides in any desired combination is lost.

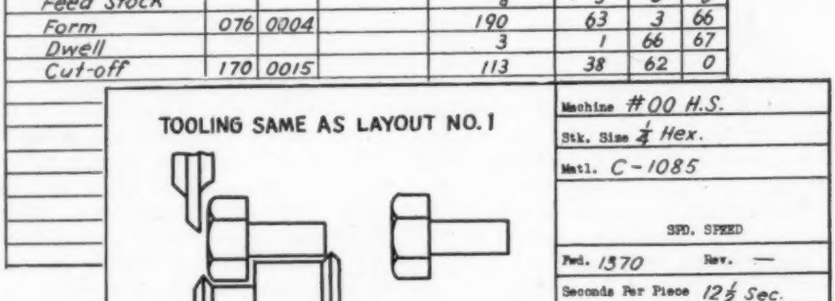
The form tool starts to cut immediately when the part is chucked in the collet. However, the cut-off tool does not start to cut until completion of the form-tool operation. This design gives the maximum machining cycle with the identical standard conservative feeds and speeds used in all five layouts on the same part. This basic layout will be termed 100% production, with a machine cycle of 13.5 sec.

LAYOUT NO. 2—Design effort is being slightly exercised. The simple principle of Layout No. 1 is still applied, and feeds are identical. However, progress may be noted as cut-off is now slightly overlapped with forming.

Any approach toward overlapping operations is a step in the right direction. As the cut-off is closest to the



SEQUENCE OF OPERATIONS	Throw	Feed	REVOLUTIONS For Each Operation	REVOLUTIONS After Deduct. Opers. Overlapped (308)	HUNDREDTHS Hdts.	From	To
Feed Stock				8	3	0	3
Form	076	0004		190	63	3	66
Dwell				3	1	66	67
Cut-off	170	0015		113	38	62	0



SEQUENCE OF OPERATIONS	Throw	Feed	REVOLUTIONS For Each Operation	REVOLUTIONS After Deduct. Opers. Overlapped (285)	HUNDREDTHS Hdts.	From	To
Feed Stock				8	3	0	3
Form	076	0004		190	67	3	70
Dwell					2	70	72
Cut-off	170	0015	113	85	40	60	100

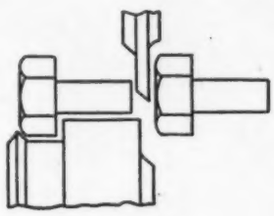
spindle, overlapping of the cut-off must not weaken the piece so it will break away from the bar while forming. In this layout, the cut-off tool machines the piece to a diameter of approximately 0.200 in. at the point where the form tool finishes its cut. Depending on part contour and material specification, a diameter must be chosen to which the cut-off tool can safely cut the part by conclusion of the form cut.

The example of cut-off, during overlap, to a 0.200-in. diameter at completion of the form cut, was computed thus: diameter over ¼-in. hex. = 0.288; a cut 0.288-0.200 on the diameter means 0.088 ÷ 2, or 0.044, on the radius, which at 0.0015 feed = 29 revs. Total revolutions required to cut off are 0.288 ÷ 2 = 0.144 plus 0.016 for the angle of the cut-off blade and 0.010 for approach and overtravel, totaling 0.170 in. which at a feed of 0.0015 equals 113 revs. When revolutions for figuring the cam cycle are added up, the 29 revs. are subtracted from the 113 revs. to give 84 revs. This simple procedure, with the identical feed, decreases the cycle time from 13.5 sec. in Layout No. 1 to 12.5 sec. in this layout, or a production of 108%. No other advantage can be claimed for this setup over Layout No. 1.

LAYOUT NO. 3 reflects continued design application which results in an advanced method of machining whereby the form tool is close to the spindle nose and the cut-off tool is further out from the spindle. In this manner, both tools can overlap each other 100% of the cam circumference with the exception of that required for the feed-out hundredths. While one piece is being cut off another part is formed.

In computing the required revolutions to make the part, only the feed out, form and dwell revolutions are considered as the cut-off is completely overlapped with forming and does not require additional revolutions. The cut-off tool is now fed only 0.00088 in. per rev. The 190 revs. required to form are all used up by decreasing the cut-off feed from 0.0015 in., as in Layouts Nos. 1 and 2, to 0.00088 in. If this fine feed on the cut-off tool had been used in Layout No. 1, the cycle time would have been increased from 13.5 to 17 sec. Contrast, however, the cycle time required in this design with either Layouts No. 1 or No. 2. The index time is lowered to 9 sec., with a production of 151%. No further demands have been made on the machine or the operator; nor have

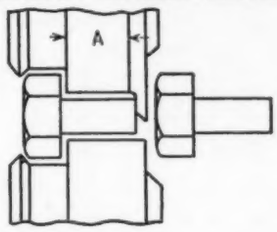
LAYOUT NO. 3



Machine #00 H.S.
Stk. Size ¼ Hex
Matl. C-1085
SPD. SPEED
Fwd. 1370 Rev. —
Seconds Per Piece 9
Cam Blank Size 4½

SEQUENCE OF OPERATIONS	Throw	Feed	REVOLUTIONS For Each Operation	REVOLUTIONS After Deduct. Opers. Overlapped (205)	HUNDREDTHS Hdts.	From	To
Feed Stock				6	3	0	3
Form	076	0004		190	95	3	98
Dwell				4	2	98	100
Cut-off	170	00088		194	97	3	100

COMB. CUT-OFF AND ROUGH FORM TOOL



FINISH FORM TOOL

Machine #00 H.S.
Stk. Size ¼ Hex.
Matl. C-1085
SPD. SPEED
Fwd. 1370 Rev. —
Seconds Per Piece 12 Sec.
Cam Blank Size 4½

LAYOUT NO. 4

SEQUENCE OF OPERATIONS	Throw	Feed	REVOLUTIONS For Each Operation	REVOLUTIONS After Deduct. Opers. Overlapped (274)	HUNDREDTHS Hdts.	From	To
Feed Stock				8	3	0	3
Cut-off	096	0015		64	23	3	26
Cut-off	079	00053		139	51	26	77
Dwell				5	2	77	79
Form	066	00047	139		51	28	79
Form	010	0002		50	19	79	98
Dwell				5	2	98	100

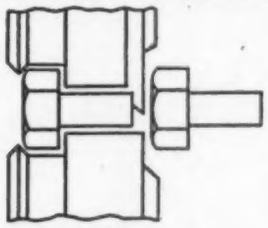
feeds been increased. In fact, the feed of the cut-off tool has been greatly reduced. These facts show progress. But what about tool life? Hexagon steel stock is a killer on tools.

LAYOUT NO. 4 is on the same part. The simple contour should present no major problem in tool design or manufacture. But what about the material specification? C-1085 steel is run only at 70 sfpm. and is only 42% machinable compared to B-1112 steel rated as 100%. Add to the problem of low machinability and hexagon stock the 0.001-in. tolerance on the formed diameter. Why not consider using a method whereby all the work is not done by the form tool but is spread out between both cross-slide tools? In the layout it will be seen that combination tooling has been introduced to prolong tool life.

The principle of the layout is that the cut-off tool, while still cutting off a previously finish formed piece, also rough-forms another. At all times the portion of the cut-off tool that roughs down the 0.140-in. diameter is working ahead of the finishing tool and concludes its cut at a diameter of 0.150 in., leaving 0.010 in. for the finish-forming tool to bring the part to size. Also, the width *A* on the cut-off tool is 0.360 in., or 0.015 in. narrower than the corresponding dimension of the part. This allows the finish-forming tool to take a light cut down the shoulder and thus to obtain both finish width and diameter.

The length of projection on the combination cut-off and forming tool which is equal to a cut-off blade is computed by taking half the rough diameter, 0.150-in., or 0.075 plus 0.005 past center, plus 0.016 for the angle of

COMB-CUT-OFF AND FINISH FORM TOOL



ROUGH FORM TOOL

Machine # 00 H.S.
Stk. Size 1/4 Hex.
Matl. C-1085
SPD. SPEED
Fwd. 1370 Rev. —
Seconds Per Piece 9
Cam Blank Size
4 1/2

LAYOUT NO. 5

SEQUENCE OF OPERATIONS	Throw	Feed	REVOLUTIONS For Each Operation	REVOLUTIONS After Deduct. Opers. Overlapped (205)	HUNDREDTHS Hdts.	HUNDREDTHS From	HUNDREDTHS To
Feed Stock				6	3	0	3
				64			
Cut-off	096	0015		76	32	3	35
Cut-off	074	00095		50	38	35	73
Cut-off	010	0002		4	25	73	98
Dwell					2	98	100
Form	074	00053		139	69	3	72
Dwell				2	1	72	73

the cut-off tool, a total of 0.096 in. A feed of 0.0015 in., as used in the previous layouts for the cut-off blade, can again be applied. When the tool has cut into the bar this amount, the flat part of the tool begins to cut on the corners of the hexagon bar, so feed must be slowed. As the tool is now cutting the same width as in previous layouts, its feed must be reduced to 0.00053 in. The rise on the cam for this feed is found by subtracting 0.096 in. from the total rise required to cut off ¼-in. hex., which measures 0.288 in. over the corners. 0.288 ÷ 2 = 0.144, plus 0.016 cut-off angle, plus 0.010 approach and overtravel, plus 0.005 extra allowance on a combination tool to make the cut-off length slightly longer than half the 0.150 diameter, gives a total of 0.175 in. Subtracting 0.096 in. for the first rise leaves 0.079 in. for the second cam rise at 0.00053-in. feed.

The finish-form tool now cuts only lightly down the shoulder of the part and finishes the 0.140-in. diameter. As both feeds on the combination cut-off tool are the maximum, as used in previous layouts, the finish-form tool cannot reach the 0.150-in. diameter until the cut-off is finished. Therefore, if the roughing portion of the cut-off tool and the finish-form tool start cutting the hex. corners at the same time and at the same feed, neither will overlap the other. However, to make certain that the roughing tool always cuts ahead of the finish-form tool, the start of the latter is delayed by 2/100ths of cam space. From the layout, the finish-form tool reaches the 0.150-in. diameter (which is as low as the roughing tool forms it) at exactly the same time as the cut-off cam. To assure accurate diameter, the form tool feeds another 0.010 in. at a very fine feed of 0.0002 in. Total revolutions to make the part are 244, which at 1370-rpm. spindle speed equal 12 sec. Production time is increased from 9 sec., in Layout No. 3, to 12 sec. However, the problem of low tool life is solved, and it is more than probable that reduced tool trouble would compensate for the longer cycle by permitting steady running. Granting this possibility, what can be done to retain the combination tooling with no loss in cycle time as was done in Layout No. 3?

LAYOUT NO. 5 offers another type of combination tooling, with all the advantages of No. 3 for production time and of No. 4 for the conservation of tool life, without the loss of either. The principle of overlap and feeds is identical to that in Layout No. 4. The advantages are gained by simply reversing the use of the form tools. In this layout, the combination rougher and cut-off becomes the finish-form and cut-off tool, and the finish-form tool becomes the rougher. As soon as the collet has closed on the bar, the rough-form tool begins to cut, roughing down the hex. to a diameter of 0.150 in. Simultaneously the combination cut-off and finish-form tool starts in to cut off the previously machined part. As the rough-form tool feed has been established at 0.00053 in., and the tool is fed into the work 0.074 in., 140 revs. will be consumed. Therefore, the portion of the combination cut-off and finish-form tool which finishes this diameter must not reach this point in any less than 140 revs., else it would pass the rougher and the principle would be lost. The cutoff portion in this layout is fed as it was in Layout No. 4, a 0.096-in. rise at 0.0015-in. feed, equaling 64 revs. Subtracting 64 revs. from 140 revs. leaves 76 revs. To consume these 76 revs. in the needed rise of 0.074 in., or 0.00095-in. feed. A third rise on the combination cut-off and finish-form cam is of 0.010 in. at 0.0002-in. feed to assure size accuracy. The cycle time is 9 sec. per piece or a production of 151% as compared to Layout No. 1.

Layouts Nos. 1, 2 and 3 were purposely made simple to lead up to the design ingenuity exercised in Layouts Nos. 4 and 5. The reason why Layout No. 5 so outmodes Layout No. 4 and yet produces piece for piece with Layout No. 3 is that the tool design allows both cross-slides to start at the same time. In layout No. 4, the roughing portion of the cut-off tool could not machine the hex. of the bar (to be turned to 0.140-in. diameter) until the cut-off portion had fed in 0.096 in. at a feed of 0.0015 in. or 64 revs. Then and only then can the finishing start. Layout No. 5 allows the roughing tool to start simultaneously with the combination cut-off and finish-form tool. The saving of 64 revs. virtually accounts for the difference in cycle time, from 12 sec. in Layout No. 4, to 9 sec. in Layout No. 5. Persistent design effort alone accomplished this culling out of all undesirable elements in the setup, leaving a maximum of advantages with a minimum of disadvantages.

Posters Stress Eye Safety

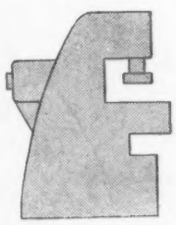
Eye accidents in industry are costly, averaging about $2,150 each, and yet they can be curtailed drastically if workers follow a few elementary safety rules. For example, goggles in a worker's pocket won't protect him from flying chips, and shields hung on a work bench never prevented a welder from an eye injury.

Colorful posters stressing eye protection have been prepared by Willson Products, Inc., Reading, Pa., for distribution to industry. They depict the joys of life which only a man with full sight can know. Contrasted is a large patch of black nothingness.

Needed: A Sensible Depreciation Policy

FOR MACHINE TOOLS AND OTHER PRODUCTION EQUIPMENT

BY BURNHAM FINNEY
EDITOR, AMERICAN MACHINIST



The United States Treasury has long adhered with little variation to a straight-line depreciation policy which emphasizes low rates. This policy makes it difficult for a manufacturer to write off equipment faster than a theoretical long-term "useful service life." It tends to discourage replacement of old machine tools and other production equipment with new machines. It is in contrast with depreciation programs in other countries. The reasons why we should change our present policy in favor of a more flexible one incorporating the principle of accelerated depreciation are set forth in the succeeding pages.

Accelerated Write-offs

BENEFIT BOTH INDUSTRY AND GOVERNMENT

THE federal government's policy governing depreciation of machine tools and other production equipment is in need of being overhauled. A more realistic program would better suit the long-term good of the national economy. The rigid straight-line method in vogue since 1934 should be abandoned and in its place should be installed a policy of writing off machines at an accelerated rate. This rate should give recognition to the fact that machines are more productive and more profitable to operate in the early years of their life than in the later years. It should take into consideration much more importantly than heretofore the factor of obsolescence as contrasted with the theoretical average "useful service life" which now so strongly influences the Treasury in determining rates.

Present policy, which has prevailed since 1934, is short-sighted. It tends to put a premium on the tax collector's ability to get as much money as possible for the government, right now. To do that, the government seems willing to sacrifice the long-range advantage of having high depreciation write-offs. More than that, this policy discourages rather than encourages manufacturers in modernizing their plant equipment and retards the lowering of production costs.

Our economy works best when industry is alert to and can make use of the latest manufacturing techniques and when it is in a position to replace the old with the new. Only by constantly discarding the outmoded and substituting the newest processes can industry hope to keep America the industrial leader of the world.

Useful Lives May Differ

It is common knowledge that the useful life of one machine may differ widely from that of another. A machine may become obsolete overnight by some new development; the worth of that machine, under such circumstances, suffers a prompt and drastic shrinkage. The length of time which it can be physically operated is no criterion of its value. Yet investigation reveals that the average write-off permitted in some segments of the metalworking industries are spread over 16 years. And the period suggested by the Treasury Department as a guide for its revenue agents is 20.74 years for machine tools!

Just what is depreciation? Webster defines it as "a decline in value of an asset due to such causes as wear and tear, action of the elements, obsolescence, and inadequacy." The Machinery and Allied Products Institute believes that "depreciation is the shrinkage in the useful earning value of an asset, due to obsolescence and to wear and tear, chargeable as a cost of operation upon such basis as may be established." One point is clear: depreciation is just as much a part of the cost of operation as rent, power, taxes, labor and materials. It cannot be forecast, however, so accurately as these other factors.

Treasury About-Face

Nineteen thirty-four was a crucial year in the history of equipment depreciation policy. It marked an about-face on the part of the Treasury, prodded by Congress. Prior to that year the Treasury allowed manufacturers to decide what their own rates should be, based on their business requirements. If these rates appeared excessive, the Treasury had to prove them unreasonable. As a result of this policy depreciation rates, though applied on a straight-line basis, averaged around 10% per year, and sometimes were even higher. In 1934, however, a proposal was made in Congress that current depreciation rates be sharply reduced. The intention was to secure for the government more revenue at a time when tax yields were small and government expenditures were growing. The Treasury countered with the suggestion that it would make effective a substantial reduction if given the chance. Congress acceded.

The result was that the Treasury issued T.D. 4422 and later Mimeograph 4170. These two orders required the taxpayer to estimate the remaining useful lives of his assets and to set up depreciation rates which would amortize the undepreciated balance over such remaining lives. Upon the taxpayer was placed the burden of proof that the rates claimed were proper, a complete reversal of previous practice.

Later on the Treasury sent to its field agents a general guide containing experience tables of depreciation rates, classified by specified machines and groups of equipment. In Bulletin F, revised in 1942, the foreword states that the rates therein pertaining to deductions for depreciation and obsolescence are "the best available indication of (Internal Revenue) Bureau practice." At the same time the Treasury agent and the manufacturer are warned that the "estimated useful lives and rates of depreciation indicated in the bulletin are based on averages and are not prescribed

for use in any particular case." They are to be looked upon solely as a starting point from which correct rates may be determined.

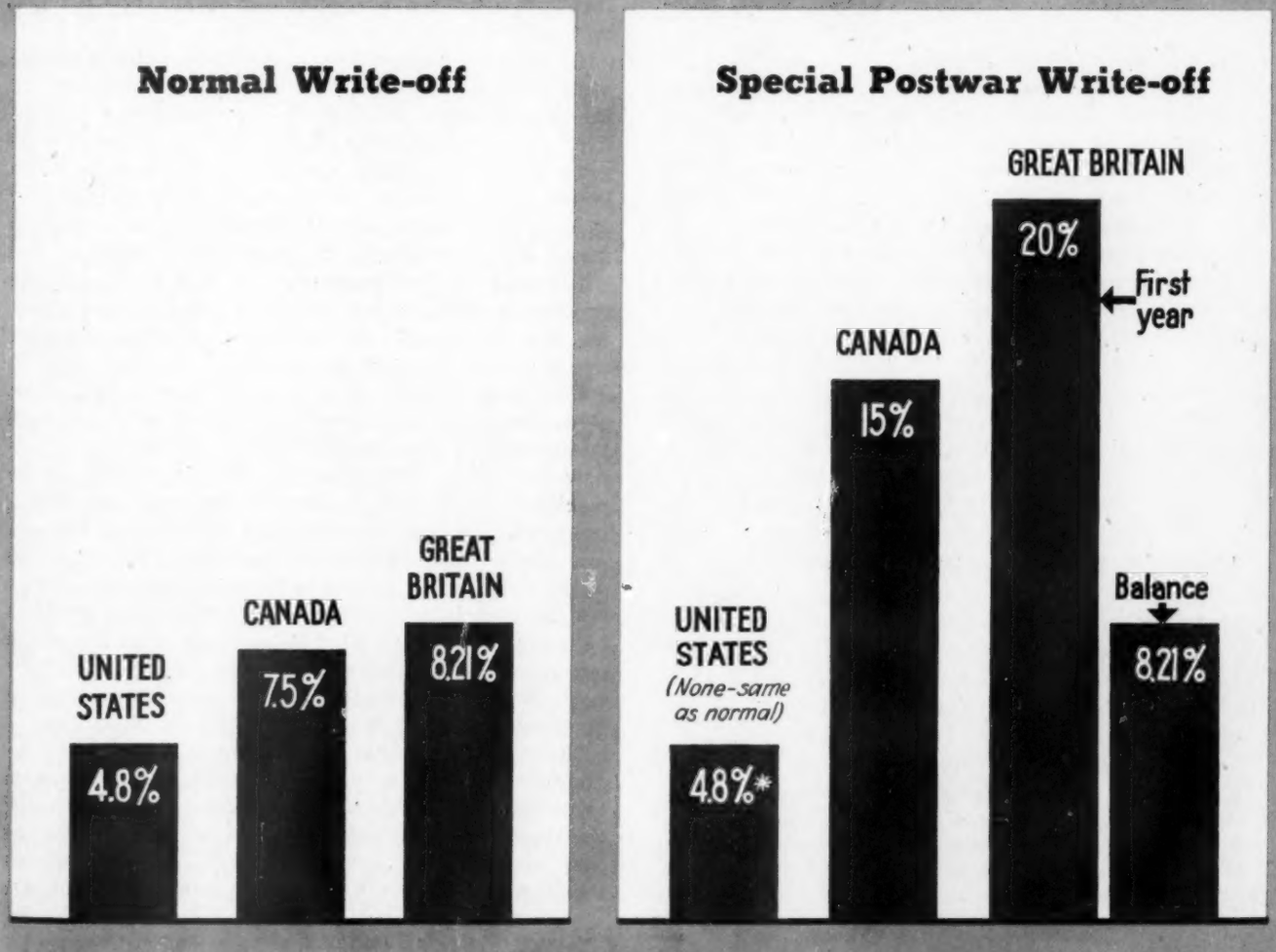
These experience tables, despite the warning to Treasury agents, have had the effect of forcing down the allowable rates. It is true that a company can get its equipment written off in a relatively short time if it can offer full proof that the useful service life is brief. It may even have it written off to current operating expenses; certain cases in the automotive industry fall within that category, the life of special machinery lasting only through a single model's production run. But these are the exceptions rather than the rule. The general policy of the Treasury is in the direction of low rates.

Examination of the average useful life of metal-working equipment in Bulletin F reveals neither rhyme nor reason in the years assigned to certain types of equipment over which depreciation should be allowed. Take portable electric and pneumatic drills, for instance. They are considered for tax purposes to have a useful life of 15 years. Depreciation of less than 7% per year is permitted. Jigs are assigned 10 years, or 10% per year, and dies six years, or little more than 16% per year. Automatic, bench, roll and turret lathes are expected to be written off in 25 years, an automatic milling machine in 18 years! And accelerated depreciation is not permitted. That is, a straight-line method is insisted upon. Accelerated rates in the first few years of a machine's use and lower rates thereafter are not recognized.

The point is that in recent years the government rather than the manufacturer has been the prime factor in deciding upon rates. Expert business opinion has been relegated to the background, if not disregarded altogether. Business men know that machines do not lose value evenly over the years, depreciating at a fixed rate. But the Treasury persists in maintaining that fiction. And Treasury agents in numerous cases haggle with manufacturers over allowable rates. The matter becomes a "horse-trading" proposition.

"The forced extension of life of standard equip-

DEPRECIATION RATES ALLOWED IN BRITAIN, CANADA AND UNITED STATES



Accelerated Depreciation

ENDORSED BY HIGH GOVERNMENT OFFICIALS

FRANKLIN D. ROOSEVELT said:

"Business, large and small, must be encouraged by the Government to expand their plants and to replace their obsolete or worn out equipment with new equipment. And to that end, the rate of depreciation on these new plants and facilities for tax purposes should be accelerated. That means more jobs for the worker, increased profits for the business man, and lower cost to the consumer."

—Campaign address in Chicago, October 28, 1944.

HENRY A. WALLACE said:

"All capital invested in genuine new enterprise should be income tax free for a period of five years or until the owner of such capital has received his investment back in the form of profit, either through income or sale, provided the investment is one in which two-thirds of the capital is spent on labor and materials. Business should be permitted to write off up to 20% in any one year its investment in machinery or buildings, provided these amounts shall be spent within a specified time for new facilities."

—New York Journal of Commerce, November 3, 1944.

JAMES F. BYRNES said:

"A number of changes in our tax structure should be introduced for the purpose of stimulating investment. . . . Depreciation rates should be permitted to vary in accordance with actual capital expenditures of business. In the years when business makes large capital outlays, it should be permitted to depreciate the capital costs much more rapidly than is now allowed. Some limitations on the percentage of the capital expenditure or of the year's income that can be so applied to depreciation is desirable, but the allowance for depreciation should be liberal when the funds are spent."

ment," remarks one industrialist, as a result of the Treasury's policy, "is a blight on our economy and one which is directly encouraged and fostered by the short-sighted approach of our tax collectors to the depreciation problem."

Treasury officials say that they are carrying out the will of Congress. They do not make the laws. They will do whatever Congress wants done. If that is true, then the only sound way in which to change our present depreciation policy to one which is more realistic and which is more in the national interest is for Congress to declare itself in favor of accelerated depreciation. It should, in effect, issue a directive to the Treasury on that subject.

Accelerated Depreciation

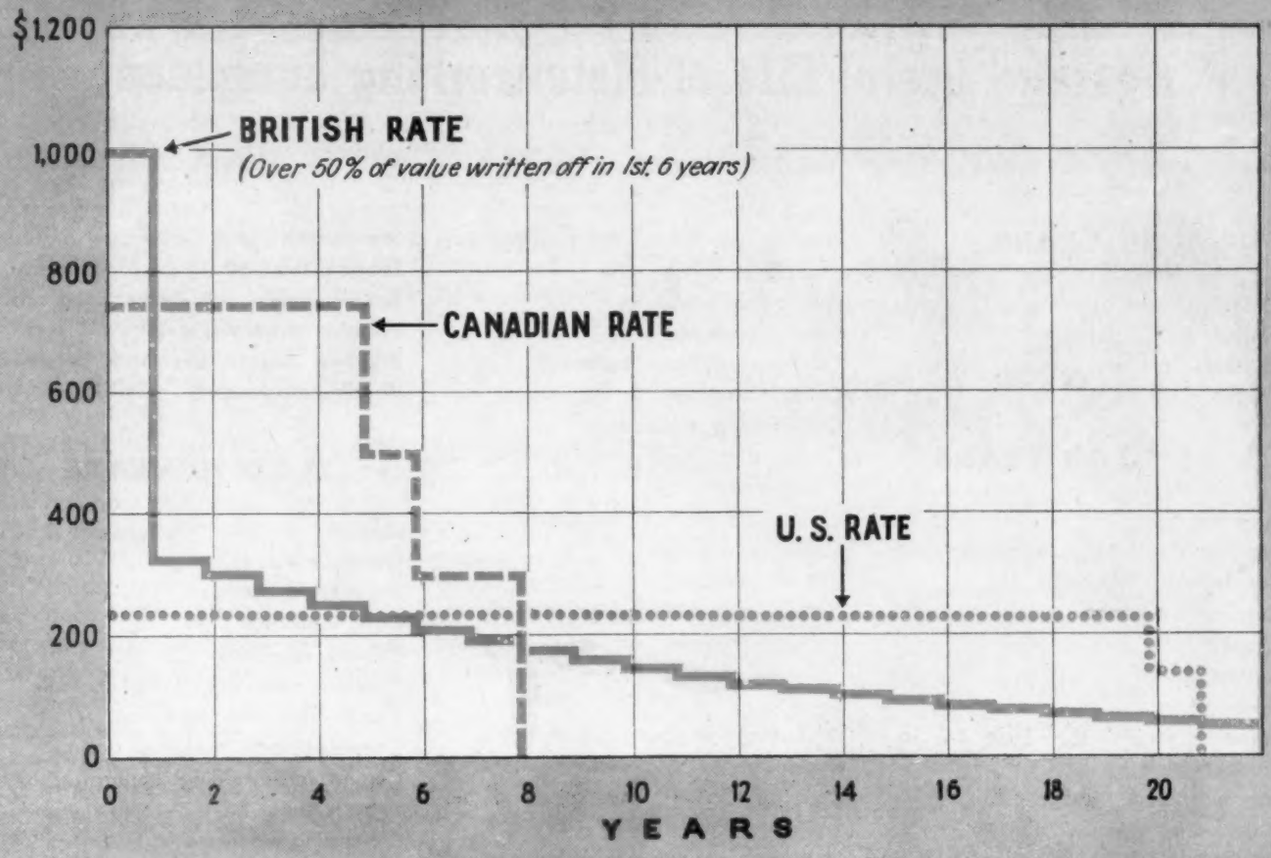
Accelerated depreciation is defined by Professor Paul T. Norton of Virginia Polytechnic Institute as "the process of writing off the investment in an asset more rapidly in the early years of its life than would be the case if straight-line depreciation were used with the rate based on the full expected life." Continues Professor Norton, "This more rapid writing off might be accomplished in several quite different ways, including such methods as an immediate writing off in the first year of an arbitrary percentage, such as one-third or one-fifth, and straight-line depreciation on the remaining amount, or by a constantly diminishing amount, such as is accomplished by the so-called fixed-percentage-on-diminished-balance method."

Accelerated depreciation also can be applied in another way. It can consist of writing off a machine by the straight-line method by shortening the "useful life." At the beginning of our national defense program it was so applied. Certificates of necessity were issued to manufacturers who spent their own money in enlarging plants and equipment to make defense items. These certificates enabled them to write off the entire cost of the equipment in five years. If the emergency ended in less than five years, thus shortening the useful life of the machines, the write-off would be for the shorter period.

The psychological effect of accelerated depreciation contrasted with long-term depreciation is tremendous in stimulating plant modernization. Under the system now prevailing, the company which is writing off its machines in 20 years is slow to buy new cost-saving machines. Though its production officials may be crying for a new battery of machines, the financial officers look at the matter with a jaundiced eye. They see the high book value of the equipment which is to be replaced and are hard to convince that the extra expense of purchasing new machines is justified. They are influenced by the low depreciation rates allowed by the government in writing off the old machines.

The man who makes an investment likes to see how and when he is going to get his money back. He wants to recapture it within the visible future, not a generation hence. Accelerated depreciation rates encourage him to spend for new equipment, because he can visualize the recovery of his investment within the

ANNUAL DEPRECIATION WRITE-OFF
in United States, Great Britain and Canada



specified time. Incidentally, whatever the Treasury adopts as its depreciation policy or compels a company to pay as a result of negotiations between its agents and the management is likely to become the depreciation policy of that company.

Ultimately the government would gain the most revenue and would help keep the national economy healthy and sound by adopting a depreciation policy which makes it easy for the manufacturer to maintain his plant in up-to-the-minute condition. To quote Frederick S. Blackall, jr., president of the New England Council, "If we can create a favorable climate in which constant modernization of industry will flourish, a favorable state of mind in which the potential buyer will switch from his investment in one machine to an investment in a newer and better machine every time a newer and better one comes along, it will increase our national efficiency to an enormous extent, will dampen the destructive swings of the business cycle, and will increase national income, which will increase the federal government's potential revenue from taxes."

For this realistic kind of policy there is ample support from government leaders. In October, 1944, President Franklin D. Roosevelt recorded in a public address his conviction that "business large and small must be encouraged by the government to expand their plants and to replace their obsolete or worn-out equipment with new equipment. And to that end the rate of depreciation on these new plants and facilities for tax purposes should be accelerated. That means more jobs for the worker, increased profits for the business man, and lower cost to the consumer." No business man could have stated the case more succinctly and convincingly. Secretary of Commerce Henry A. Wallace, as vice president in 1944, endorsed accelerated depreciation, as did Secretary of State James F. Byrnes when he was director of war mobilization and reconversion.

Our government, as already mentioned, has given more than lip service to the principle of accelerated depreciation. When Washington sought to induce industry to expand its facilities in 1940 as we began our national defense program, it resorted to a 60-month amortization scheme for plant and equipment. There was a tremendous spurt of buying of capital goods, including machine tools, by private industry with its own funds. Huge expenditures were made by manufacturers because they could see ahead the writing off of the complete investments within a reasonable time

U. S. Treasury Department's Estimates of

Average Useful Life of Metalworking Equipment

30 YEARS

Cranes, electric traveling
Lathes, woodworking
Slotting machines
Testing machines

21 TO 25 YEARS

Agitators
Bending machines, sheet-metal, wire
Boring and turning mills
Centering machines
Cranes, ladle and locomotive
Cutters, bolt
Drills, heavy-duty, horizontal, radial
Furnaces, annealing
Furnaces, forging
Hammers, drop, steel forging
Hoists, skip, steam or electric
Keyseaters
Lapping machines
Lathes, roll, turret
Nail-making machines
Nut and bolt machines
Ovens, annealing
Ovens, core
Planers, metalworking
Presses, arbor, bench straightening, forging and forming, hydraulic, multiple-plunger, scrap-bundling
Punching machines
Shapers
Shearing machines
Shearing machines, hydraulic
Upsetting machines

16 TO 20 YEARS

Babbitting machines
Balancing machines
Barrels, tumbling
Boring machines
Bending machines, angle, eye, bar, circle or spiral
Buffing machines
Burring machines
Chucking machines, automatic
Coiling machines
Core-making machines
Cranes, auto truck, gantry (electric), jib, monorail
Cranes, electric-truck mounted
Crimping machines
Cut-off machines
Cutting and welding apparatus, electric
Cutting machines, cam, gear, pipe and thread
Derricks
Die-cutting machines, automatic
Die-sinkers
Drawing, coiling and spiralling machines, wire
Drills, automatic, bench multiple-spindle
Drills, sensitive
Filing machines
Forging and upsetting machines
Galvanizing machines
Gear-cutting machines
Grinding machines
Hammers, belt or motor drive
Heading and forging machines
Hobbing machines
Honing machines
Lathes, spinning
Milling machines, automatic
Milling machines, universal, vertical
Ovens, preheating
Pickling machines
Reaming machines
Rivet-making machines
Riveters, hydraulic
Saw filing, setting and sharpening machines
Screw machines
Slitting machines
Straighteners, wire
Tapping machines
Tumbling mills, steel-frame wood box
Washing machines, metal
Winches, electric, pneumatic or steam
Winding machines

11 TO 15 YEARS

Blowers
Brakes, metal forming
Broaching machines
Cars, industrial
Casting machines
Chucking machines, multiple spindle
Chucks, drill and lathe
Conveyors, belt, bucket or chain
Cutting and welding apparatus, oxy-acetylene
Die-casting machines
Drills, electric and pneumatic, portable
Hoists, air, chain and electric (small units)
Milling machines, die trimming and sinking
Milling machines, hand
Molding machines
Plating machines
Polishing machines
Profiling machines
Riveters
Seating machines, valve heads
Trucks, hand
Trucks, warehouse and barrel

5 TO 10 YEARS

Cutters, mixers, slingers and strippers for sand
Dies
Jigs
Trucks, electric

limit. If this kind of incentive is good for the country's economy in time of peril, why not in time of peace?

Our own government was not the first, however, to stimulate private investment in new capital equipment by adopting a policy of accelerated depreciation. Herr Hitler did it in Germany back in the early thirties. In his desire to build up a munitions industry and to prepare all of German industry for possible war service, he permitted quick write-offs if German industrialists would put their money into new plant and machinery. Admittedly this action alone should not be given full credit for modernizing Germany's metalworking facilities. Hitler's orders for planes and munitions were a powerful factor. But accelerated depreciation was an integral and important part of the German expansion program.

Britain's Policy

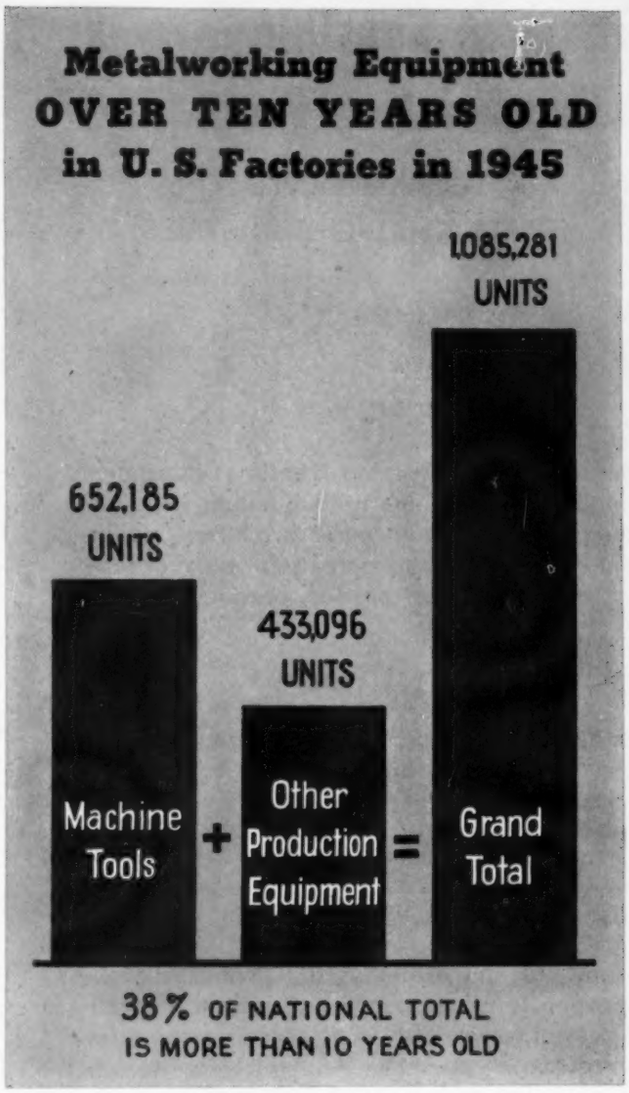
The British have long recognized the desirability of some form of accelerated depreciation. Britain's basic depreciation policy for capital equipment was established in the British Income Tax Act of 1918. An additional 10% was authorized by the Finance Act of 1932. Six years later, in 1938, the allowance was increased to one-fifth more than the normal rate. Recognition of obsolescence as well as service life was one of the considerations in permitting this increase, although the stimulus to expand for defense purposes was a basic factor. This extra 20% over normal rates was discontinued on April 6, 1946.

To encourage postwar expansion of its industries Britain provided in the Income Tax Act of 1945 for a 20% write-off of equipment in the first year of usage. Government spokesmen said that this action "represented very substantial financial assistance to industry in carrying out its postwar reequipment."

The British tax policy adheres to the "declining-balance" method. Even before 1945 the annual depreciation rate was based on the remaining book value. Although the percentage allowance was fixed, it was computed on a steadily declining book value. If a machine was purchased for $1,000, let us say, the first year's write-off would be $100 if the rate was 10%. The rate the following year would be applied against the remaining book value of $900 instead of the original purchase price of $1,000.

Accelerated Write-offs Allowed

Britain made special provision for added depreciation rates in the case of overtime and multiple-shift operations during the war. In some instances as much as 50% more than the normal allowable write-off was permitted. In the aircraft industry, depreciation rates as high as 18¾% were set for precision equipment used on multiple shifts. By contrast, U. S. manufacturers attempting to take increased depreciation allowances for excessive wear and tear due to two- and three-shift operation have had rough going. The Treasury has argued against increased depreciation in some cases, in others Treasury agents have whittled down the amount allowed, and in still others changes have been bluntly denied.



Normal write-offs for plant and machinery in Canada are 5%-10% with the average around 7½%. In November, 1944, the Canadian Parliament passed a "double-depreciation" law as an inducement to manufacturers to expand their postwar activities and invest in new equipment. Under this law a company may write off its new facilities at twice the normal rate if it can prove that such facilities aid postwar employment. An interesting feature of the law is the option given the manufacturer of taking "double depreciation" or one-half the regular rate at his own option. The double write-off expires when 80% of the value has been depreciated, after which the normal rate applies. The "double depreciation" privilege will end on December 31, 1946. The Canadian government reports that more than $280,000,000 in new facilities have been approved with this special allowance.

Though Germany, Britain and Canada have made special provision for accelerated depreciation in some

A Sensible Depreciation Program

FOR AMERICA'S METALWORKING INDUSTRIES

1

Congress should direct the Treasury Department to allow manufacturers to take higher write-offs on machine tools and other production equipment in the earlier and more useful years of service than in the later and less productive years.

2

Management should be given considerable leeway, within the scope of sound accounting, in deciding what the depreciation rate for its own equipment should be.

3

Federal tax authorities should give more consideration to obsolescence and less to theoretical "useful service life" in determining depreciation rates.

4

Manufacturers should use depreciation reserves only for replacement of old equipment with new, and not for any other purpose.

"**WHAT IS NEEDED** is a lively recognition by statute, which will not be nullified by shortsighted interpretation, that every time a manufacturer tosses out a less-efficient machine and purchases a more-efficient machine, the public benefits and potential revenue over the long term is increased. Certainly Uncle Sam recognizes that the prosperous taxpayer has the largest tax-paying capacity."

Frederick S. Blackall, Jr.,
President, New England, Council

form, thus far no hint has come out of Washington indicating that the Treasury intends to move away from its present position in favor of a straight-line, low-rate depreciation policy. The only recourse is to Congress, as mentioned earlier.

Congress should enact, therefore, a law authorizing and directing the Treasury to permit American industry to write off its machine tools and other production equipment at a faster rate than now prevails. The new policy should encourage higher depreciation rates in the earlier and more useful years of equipment than in the later and less productive years when obsolescence exerts an ever-growing influence. It should permit manufacturers considerable flexibility, within the bounds of sound accounting, in deciding what the depreciation rate for their own equipment should be. And tax authorities should be instructed to give more consideration to obsolescence and less to theoretical "useful service life" in determining equipment depreciation rates.

The result of this policy would be a depreciation-rate curve which might be fairly steep the first few years following acquisition of a new machine. The curve then would tend to flatten out. If the manufacturer so desired, he could use the straight-line method with a rate substantially higher, perhaps up to 50%, than the rate based on the full expected service life.

Methods, Not Penalties

The main point is that, as Professor Norton said recently at a session of the National Industrial Conference Board, "we are aiming at neither tax incentives nor tax penalties, but rather tax methods which will produce the revenue we need with the least possible interference with the system which has always produced jobs through the investment of capital in fixed assets."

While the government is revamping its depreciation practices, and is authorizing industry to use a flexible, sensible system of write-offs, manufacturers should stick religiously to a policy of spending depreciation reserves for new equipment which will keep their production techniques abreast of the latest developments. Those reserves should be regarded the same as though they were in a separate bank account to pay for new capital expenditures.

In recent years the trouble has been that businessmen have not been spending their depreciation reserves annually as they should. One of the major contributing reasons is that they have not been permitted to depreciate their equipment as rapidly as it becomes obsolete. If such accelerated depreciation is made part and parcel of the Treasury's day-to-day practice, there will be much greater incentive for manufacturers to spend their depreciation reserves instead of hoarding them.

A combination of accelerated and flexible write-offs, with regular expenditures of depreciation reserves to replace the old with the new, should go far in helping to perpetuate a healthy economy in industrial America.

ROUND TABLE

To Be—Or Not to Be—Your Own Boss?

"SAY, ED, how come that vernier caliper you lent me this morning is stamped 'APCO'? Swap it somewhere for a brass check?"

"No, Al. That's about all I salvaged from the Apex Machine Company a couple of us started back before the depression. We found out—but fast—that good mechanics eat oftener and sleep better when they work for a good businessman."

"The guy that clipped your wings even made you like it, didn't he? And scared you into this job so solid I always thought you served your time here. Why didn't you stick it out? Boy, if I ever get a couple of dollars to rub together I'm gonna start my own shop. Then if I get a bright idea, I get the dough for it."

"Yeah, and if you get a bum one, you lose your shirt. This bein' your own boss ain't all it's cracked up to be. Here you get a check every two weeks, and somebody else pays for your bulls. Sure, the Old Man collects for your smart tricks, but he shells out through the lean streaks—even gives you a raise or a better job every once in awhile."

"I'd rather give myself a raise when I earn it, and do things my way. I could work when I need to, and go fishing when I feel like it."

"That's what you think, Al. It don't work out that way. Here, when you go home, you can leave the shop behind. When you're the Boss, you take the shop with you when you leave. There's always some bills comin' in, a new machine to buy, somebody to hire or fire, or some book work you didn't have time for."

"What a Gloomy Gus you are, Ed! Sleeping bad, or just feeling your age? You've got most of those worries anyway. I'd hire a bookkeeper to worry about the books and the bills—and cut out a lot of red-tape records."

"And then go home and worry about the bookkeeper. What would you pay him with—buttons? Don't you realize that everybody you add to the pay-roll you have to work just that much harder to pay for? You can't just be a good mechanic and get along. You gotta be a good businessman too. You gotta buy low and sell high, fill out all them forms for Uncle Sam, pay Social Security and donate to every drive for dough. You gotta do all your own plannin' and decidin'."

"I know all that, Ed. I even took some night courses in bookkeeping and accounting a couple of years ago. Sure it's a gamble and a lot of work, but I'm willing to bet on myself and work like the Devil to make my bet pay off. I'd get a bat out of running the whole setup that I'll never get working for somebody else."

"Well, I found out that runnin' the whole setup ain't all it's cracked up to be. First thing I knew, it was runnin' me. When it started givin' me nightmares, I quit. Life's too short to sweat all day and to watch your dollars fly away all night".

"I guess you aren't a good poker player, Ed. You play too hard and worry too much about it. You've got to be able to forget your troubles at will, or it's safer to work for somebody else and let him do the worrying. I think I could handle all that, if I just had the dough."

"That's the worst of the problems, Al. I'd rather have my dough comin' in regular than play the long shots, win or lose."

***WHAT'S YOUR OPINION**—self-owned business, with its ups and downs, or relative safety working for somebody else? Have you, or has somebody you know, tried it? Your opinions or experiences, pro or con, will be helpful to others. Published letters will be paid for. Discussions of earlier topics appear in later pages.*

Guard Your Tools

BY MILTON L. BORDEN

TOOL SUPERINTENDENT, CROCKER-WHEELER ELECTRIC MFG. CO., DIVISION OF JOSHUA HENDY IRON WORKS

Tool-control system saves 60% in tool purchases, cuts inventory and breakage 40%, reduces lost time of men and machines, transfers tools where needed

THIS YEAR YOU undoubtedly will buy thousands of dollars worth of small tools, such as taps, drills, reamers, gages, special tools and other related shop items. As requisitions for tools and supplies come to your desk, have you ever wondered what the shop does with all the tools you buy and whether they are all necessary?

You know that many of these items "go out the door or over the fence" soon after they are bought, while some are used until they are worn out. Still others are hoarded in workers' toolboxes so each man can feel secure in having a vast supply of tools at hand to do any job without going to the crib for tools. Of course, other operators are deprived of the use of these tools unless an unreasonably large inventory is maintained to supply all operators with all tools. But Joe, the lathe operator, says to himself, "So what! I gotta have tools, ain't I? Let them buy some more." So the company buys, and buys, and buys.

All this may happen despite the fact your shop may issue all tools from one or more cribs and accept a metal check or some other token in exchange for each tool. In substance, this means that your tools actually are worth no more than metal checks, and metal checks are pretty cheap. The check system has many faults, and employees know it is "easy to beat." So dollars worth of tools disappear every year, and nothing much can be done to correct the condition unless a systematic method of controlling tool purchases and issuances is installed.

Under the brass-check system, when no simple control records are kept, a worker acknowledges receipt of a tool with a brass check which is hung on a hook in place of the tool. In theory, here is a record of the transaction and accountability. In practice, it just doesn't work. An operator may quit or be transferred from one department to another, and the chances are strongly against the crib attendant being able to find all the checks issued against the operator, strewn about as they usually are among shelves and drawers, or hung on the wrong hooks.

The same inefficient scattering of tools and checks also operates to prevent good control of tool inventories. An unusual number of any one type of tool being withheld by operators for long periods of time will ultimately result in the crib attendant finding himself low or out of stock altogether. So he requisitions more tools, and up goes the inventory.

Previous to April, 1942, the tool cribs at Crocker-Wheeler were attended by several men who had worked nearly a lifetime on the job and were so familiar with small-tool stocks that they could reach behind them without looking and take from a bin almost any tool which an operator wanted. The crib men knew more about the tools and where they were than did management. But when our production was stepped up and our shop personnel tripled at the start of the war, we had to add new cribmen to handle the increased volume of transactions at the crib windows. When new attendants were put on the job they were lost for weeks, until they devised their own methods of keeping tool records. So operators and toolmakers stood in line and small tools disappeared into the shop, never to return.

Card Control

We knew we had to do something —and fast, so we set up a separate and distinct tool-control department to control all tools, gages, jigs, fixtures and operating supplies such as files, hacksaw blades and sandpaper. This department under the tool superintendent is coordinated with the manufacturing engineering department under the manufacturing engineer, who in turn is responsible to the plant superintendent.

To accomplish our plan of tool control, we decided to install a system devised by the McCaskey Register Company. Our first step toward modernization was to clean out the tool cribs and scrap all obsolete and unusable tools. Jigs, fixtures and gages were separated from small or standard tools. A complete inventory of all remaining items was taken and a notice issued to the shop requiring employees to return all brass checks and tools. A month was allowed to accomplish this and inventories were adjusted to account for the tools returned during that time. The results were astounding, as we had returned to the cribs better than $3000 in small tools that we neither knew had been issued or where they were.

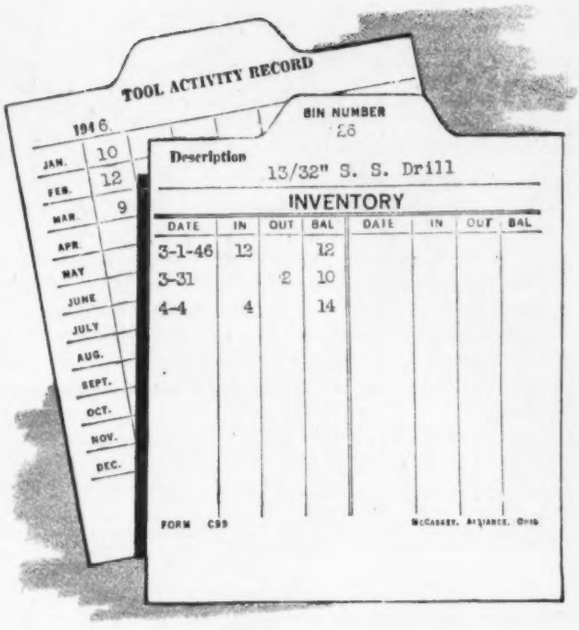
The physical layout of each crib was rearranged to accommodate efficient storage of small tools and gages, by sizes and frequency of use so that employees could be serviced from the windows with a minimum of waiting time. Suitable storage bins and racks were bought or made. Each type of tool was described and numbered, and a printed inventory card made out for the tool and assigned a proper location on a clip-spring panel control board adjacent

to the crib window. This was repeated for every type and size of tool maintained in the crib, so by consulting the card the attendant can immediately locate the tool and also know how many of that type he has, whether in the crib or in use. Special racks were built to store jigs and fixtures whose purposes, code numbers and corresponding blueprint numbers were also typed on control-panel cards. In this manner, an operator need only call at a crib with a print to receive the right jig for the job.

The basis of the system is use of carbon-backed Tool Order slips which are made out in triplicate by operators for any tool they require. Each operator has a block of these slips at his machine. When a tool is needed he merely fills out the slip by inserting the name of the tool, his clock number and date and signing the slip. He retains the yellow copy, the white copy is inserted under a clip of a panel board in the crib on which are posted the names of all employees allowed to draw tools from that crib. The pink copy is clipped in front of the card that represents the type of tool he has borrowed. When he returns the tool, the white copy is returned to him, which he destroys along with the yellow copy to cancel his obligation for the loan of that tool. The pink copy is then filed in back of the card representing the tool. The total number of pink slips that accumulate with the card each month shows us the activity of each tool and enables us to maintain the proper reserve in that particular crib and shift tools from one crib to another, wherever needed. By so doing we have eliminated excess stocks and have discontinued such items that we found were not used in departments serviced by that crib.

INVENTORY CARD, one for each size and type of tool, is spring-clipped to panel control board in tool crib. It shows location and description of tool, how many are in use and balance on hand

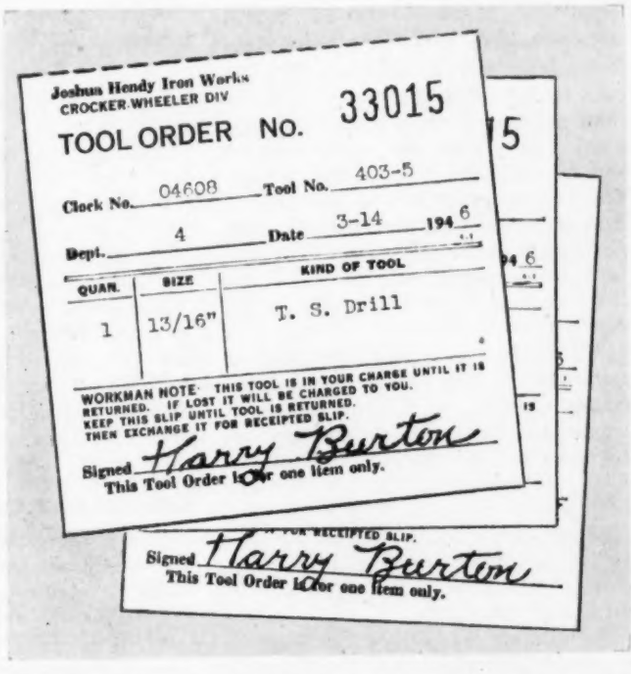
TOOL ACTIVITY RECORD, on reverse side of inventory card, is posted monthly to show how often a particular tool is used. It aids in maintaining proper inventory and redistribution of tools between cribs



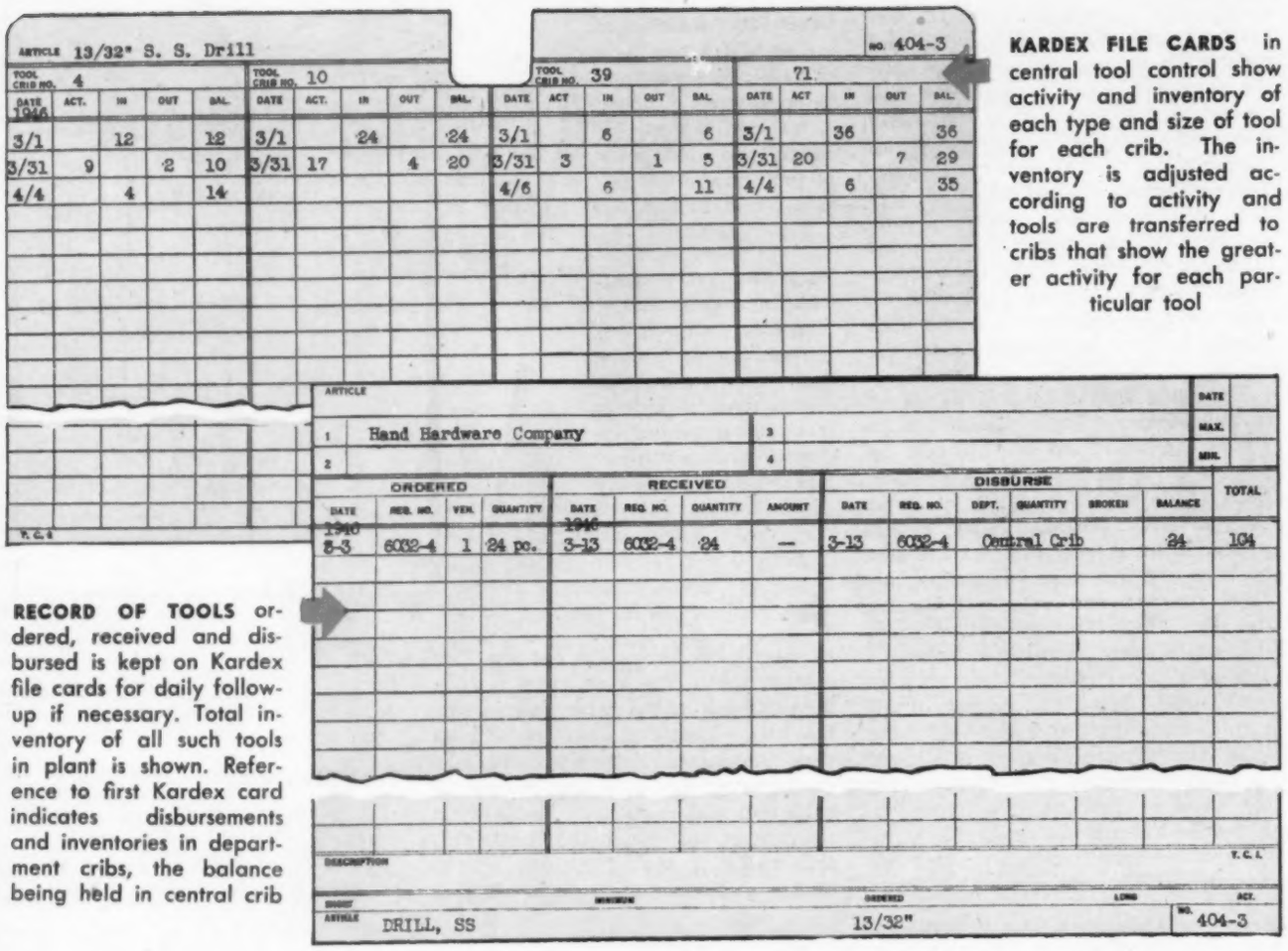
Tool Breakage

If a tool is broken or lost, the operator must fill out in triplicate a Broken Tool Report, signed by his foreman or supervisor, in order to re-

BROKEN OR WORN TOOL REPORT is made out in triplicate by operator and signed by foreman to relieve operator of accountability. From these slips a monthly report is sent to management and a Kardex card is kept for each man showing complete record


Joshua Hendy Iron Works
CROCKER-WHEELER DIV
TOOL ORDER No. 33015
Clock No. 04608
Tool No. 403-5
Dept. 4
Date 3-14 1946
QUAN. SIZE
KIND OF TOOL
1 13/16" T. S. Drill
WORKMAN NOTE: THIS TOOL IS IN YOUR CHARGE UNTIL IT IS RETURNED. IF LOST IT WILL BE CHARGED TO YOU. KEEP THIS SLIP UNTIL TOOL IS RETURNED. THEN EXCHANGE IT FOR RECEIPTED SLIP.
Signed Harry Burton
This Tool Order is for one item only.

TOOL ORDER SLIP, made out in triplicate by operator, is exchanged for tool. One is retained by operator, another inserted in name panel board and third clipped to inventory card. When tool is returned, operator destroys first two and last one is filed to show activity



ARTICLE 13/32" S. S. Drill — NO. 404-3

TOOL CRIB NO. 4					TOOL CRIB NO. 10					TOOL CRIB NO. 39					71				
DATE 1946	ACT.	IN	OUT	BAL.	DATE	ACT.	IN	OUT	BAL.	DATE	ACT	IN	OUT	BAL.	DATE	ACT	IN	OUT	BAL.
3/1		12		12	3/1		24		24	3/1		6		6	3/1		36		36
3/31	9		2	10	3/31	17		4	20	3/31	3		1	5	3/31	20		7	29
4/4		4		14						4/6		6		11	4/4		6		35

KARDEX FILE CARDS in central tool control show activity and inventory of each type and size of tool for each crib. The inventory is adjusted according to activity and tools are transferred to cribs that show the greater activity for each particular tool

ARTICLE — DATE / MAX. / MIN.

1 Hand Hardware Company — 3 — 2 — 4

ORDERED				RECEIVED				DISBURSE						TOTAL
DATE 1946	REQ. NO.	VEN.	QUANTITY	DATE 1946	REQ. NO.	QUANTITY	AMOUNT	DATE	REQ. NO.	DEPT.	QUANTITY	BROKEN	BALANCE	
8-3	6032-4	1	24 pc.	3-13	6032-4	24	—	3-13	6032-4	Central Crib			24	104

DESCRIPTION — T. C. I.

ARTICLE DRILL, SS — 13/32" — NO. 404-3

RECORD OF TOOLS ordered, received and disbursed is kept on Kardex file cards for daily follow-up if necessary. Total inventory of all such tools in plant is shown. Reference to first Kardex card indicates disbursements and inventories in department cribs, the balance being held in central crib

lieve himself of accountability for the tool. One copy is retained with the card representing the tool so that the total number of slips at the end of a month designates the total number broken or lost during that period. The second copy is sent to the cost accounting department and the department in which the tool was broken is charged with its value. The third copy is given to the operator to retain if he wishes or to destroy.

All broken-tool slips are sent to tool control for further study, decision whether to salvage, scrap or repair the tool, and adjustment of inventories in central tool-control files. If conditions in any instance are serious enough, departmental foremen are consulted either to correct careless operators or instruct inexperienced men in an effort to reduce tool breakage.

A monthly record of breakage is compiled and sent to the management for whatever further steps are considered necessary, whether the fault lies with operator, method or operating condition. In tool control, a Kardex card report for each operator, posted monthly, shows whether he is costing us more in broken tools than he is worth in production.

By consulting the control-card panel we can determine what and how many tools each operator has in his possession and how long he has had them, and by consulting the control card representing the tool itself, we are able to tell at a glance how many we have of any type or size of tool and where they are. In case an operator leaves the company or is transferred to another department, we can immediately issue his clearance by referring to his clock number card on the panel board.

Central Tool Control

Under the present plan, all tools are controlled from the central toolroom, a master crib in which tools and supplies are stored and distributed to departmental cribs. Crib men are provided with requisitions which they forward to central tool control to replenish their stock of tools on which they may be low. Crib men are required to inspect all tools returned to them after use and for any broken tools to obtain a broken-tool slip from the operator. If any tools are dull or need minor repairs, they are held in the crib and picked up by tool messengers twice daily, taken to the proper departments for such repairs or sharpening and then returned to the crib.

A monthly checkup is made of tools out on tool order slips and those not in actual use are required to be returned. At the same time, condition of tools is checked and any requiring sharpening or repairs are reconditioned before being returned to their bins. At longer intervals all tools are inventoried and checked for obsolescence, particularly special tools such as jigs and fixtures. If circumstances warrant, in the opinion of the engineering department, these tools are removed to central tool control storage facilities until such time as they are needed or scrapped.

The successful installation of a new system depends on the cooperation of the workers, especially the crib attendants. Our tool cribs are light and airy, and wood or rubber floor coverings have been laid to insure

safe and pleasant working conditions for the crib men. Foremen of the various departments serviced by a tool crib will do much to insure success when they realize that the tool control department is trying to maintain proper and sufficient tools for their departments. Foremen also many times have excellent ideas as to what they want or need, and can be of great assistance in anticipating their future tool requirements.

Many workers at first object to the signing of tool loan slips, claiming it takes too much time, especially if they are piece workers. We have refuted this statement many times by making time studies over a 10- or 24-hr. period of the various transactions at a given tool crib. We have found 500 to 700 transactions during a study, each taking an average of 30 sec. to take a tool slip from an operator and secure his tool from a bin for him. Under the old brass-check system we have determined that individual transactions take an average of 1.4 to 2.2 min., most of this time having been spent in searching for the brass check, searching for the tool and arguments between crib men and operators. Less non-productive time spent at tool cribs means more production at the machine.

Inventory Reduced 40%

The advantages of the system lie not only in saving time but in reduction in costs, tool loss and disputes between crib men and operators. We have reduced tool purchases by approximately 60% and already have saved its cost many times over in the better control of tool inventories and purchases. Three different times we have been able to reduce our tool stocks, until now we are operating with a 40% reduction in the total number of tools, but with more and better tools of the right kind.

Equally important to the advantages in the shop is the advantage gained from installing proper records in central tool-control offices to present information to management concerning the tool investment. We have accomplished this by installing a Kardex system of filing cabinets, in which are cards in exact duplicate of the panel-control cards in the various tool cribs. Requisitions and withdrawals that affect inventories in either central tool storage or the cribs are posted daily and immediate records are available as to purchases, requisitions, breakage and activity. Such information is posted from total figures supplied by the cribs.

Tools and supplies are all requisitioned by means of a "store call" to the purchasing department. The tool superintendent is the only one vested with authority to order these classes of equipment, because he is then able to keep records of all material on order and expedite it if not received on time or in expectation of a particular purpose. Requisitions for purchases are dictated by tool activity to maintain proper inventory levels and by requests from production control, engineering, and methods-planning departments in connection with tooling for new jobs at a future date. In this manner, all small and standard tools are available when needed and not left to "hoping it is in the tool crib."

Many Advantages

Material on order is checked in file daily and if not received on the promised delivery date it is referred again to the purchasing department for contact with the supplier as to when it will be received. When received at the receiving department, it is inspected for quality and quantity and delivered to the central tool-storage crib, signed for by the central crib attendant and recorded on the Kardex file cards. It is then delivered to cribs which have requisitioned that particular material, or is held in storage in the central crib.

Our card control system has given us many advantages other than those mentioned, effecting savings and convenience of operation alone which have more than offset the cost of installation. We now know what tools we have, where they are and what they cost. Lost time for men and machines is at a minimum, and if operating conditions change and further time can ever be saved it will be apparent if careful attention is paid to information available from the tool records we maintain. We have been unable to find any other method or system which furnishes such a wealth of information at a glance with such a small investment for installation or operation. Since the system was installed, we have been able to reduce the number of tool cribs necessary to maintain our plant from seven to five and number of crib attendants from eleven to six. Breakage has been reduced 40%, and lost or stolen tools are negligible. We maintain far more production with less tools by enforcing the return of tools when jobs are finished, hoarding is practically eliminated, and we are provided with up-to-date knowledge of actual production requirements based on tool activity.

TIPS for Top Shop Men

57 Russia and modern production have both thrown out the czars. Personal, religious or political differences, grouches from indigestion or domestic troubles, and whims about the color of a worker's hair or eyes or his place of birth are not excuses for hiring or firing as you please.

58 You are the company to everyone who works for you. If you are fair, honest, firm but reasonable, and considerate, the men under you will believe the company has all those virtues. If you are tricky, harsh, unfair or a driver—the company will be assumed to have the same attitude. The only way it can prove it hasn't is to get rid of you.

59 Every new employee costs $50 to $500 to train, in terms of your time or others and in slowed, lost or spoiled production. With that much initial investment, be sure you don't waste it idly. But don't throw good money after bad.

60 You are not a driver, a routing clerk or a time clerk; you are a production executive responsible for a department. Maintain that attitude, and others will recognize it.

61 Keep posted on latest developments in tools and methods, wage payments and other production incentives, and other management matters, even if they are not your personal responsibility. Remember, the man who gets a bigger job is the man prepared for it.

62 Management is *not* a set of rules to be followed regardless of circumstances. The good executive knows when to *break* a rule.

63 Copy the Boy Scout in one thing at least—"Be Prepared." Estimate *in advance* what should be done in case of any contingency.

64 Loyalty, like morale, is not built from the bottom up—it filters from the top down. You must be loyal to your job and your principles, or you can't expect your men to be. Give them something to be loyal to.

PROCESSING OPERATIONS IN Powder Metallurgy

Five methods of compacting two metal powders are compared in diagrams and step by step. . . . Basic definitions clarify terminology

BY DR. HENRY H. HAUSNER
CONSULTING ENGINEER

GENERAL processing operations in powder metallurgy are described, and five different series of processing steps for the production of a compound material consisting of two different metal powders have been charted in the accompanying flow diagram. These standard definitions of terms may facilitate both the reading of the diagram and greater understanding of the art in general:

Powder Metallurgy: The art of producing metal powders and shaped objects from individual, mixed, or alloyed metal powders, with or without non-metallic constitutents, by pressing or forming objects which are simultaneously or subsequently heated to produce a coalesced, sintered, alloyed, brazed or welded mass, characterized by absence of fusion or fusion of a minor component only.

Pressing: The forming of a compact under pressure.

Compact (Synonymous with "briquette"): An object produced by the compression of individual, mixed or alloyed metal powders, with or without non-metallic constituents.

Sintering: The heating of metal powders or compacts to convert them into coalesced, alloyed, brazed or welded masses, under controlled conditions of time, temperature and atmosphere.

Pre-Sintering: The heating of a compact at a temperature below the normal final sintering temperature, usually to increase the ease of handling or forming the compact or to remove a lubricant or binder prior to sintering.

Continuous Sintering: Pre-sintering or sintering in such a manner that objects are advanced through the furnace at a fixed rate by manual or mechanical means.

Sizing or Coining: Final pressing of a sintered compact to get desired size or physical properties.

3-STEP PROCESS a:

STEP 1. Powders *A* and *B*, having been weighed, are mixed in a mixer. Mixing may occur dry or wet; time depends on the type of powders. Two hours mixing is average.

STEP 2. Mixed powders are compressed in a mechanical or hydraulic press. Pressures from 5 up to 100 tons per sq.in. and higher are used. 30 tons per sq.in. is an average.

STEP 3. The pressed (green) compact is sintered in a resistor or high-frequency furnace at suitable temperature and time, in a reducing or neutral-gas atmosphere.

5-STEP PROCESS b:

STEP 1. Same as in Process *a*.

STEP 2. Same as in Process *a*.

STEP 3. Sintering in the furnace occurs at a lower temperature or in a shorter time, so the sintering action is not complete. The compact is no longer "green," but not quite sintered. It is "presintered." Mechanical properties of the compact are poor.

STEP 4. The compact can easily be formed to the right shape by machining.

STEP 5. The shaped piece is to be sintered a second time (high-sintering) to acquire the proper physical properties, such as density, hardness and strength.

4-STEP PROCESS c:

STEP 1. Same as in Process *a*.

STEP 2. Same as in Process *a*.

STEP 3. Sintering in the furnace occurs at the conditions of Process *a*. The sintered compact, however, does not yet have the desired properties . . .

STEP 4. Coining is, therefore, necessary. Hot-hammering, repressing, rolling, extruding and drawing are some of the usual methods of coining. (Another heat-treatment after coining must sometimes follow.)

2-STEP PROCESS d:

STEP 1. Same as in Process *a*.

STEP 2. Pressing and sintering are combined in "hot-pressing." Compacting pressure is generally lower than in the case where pressing occurs at room temperature, and pressing temperature is generally lower than the respective sintering temperature. At present, this method is used less frequently than the above-described processing methods. However, it offers many future prospects.

3-STEP PROCESS e:

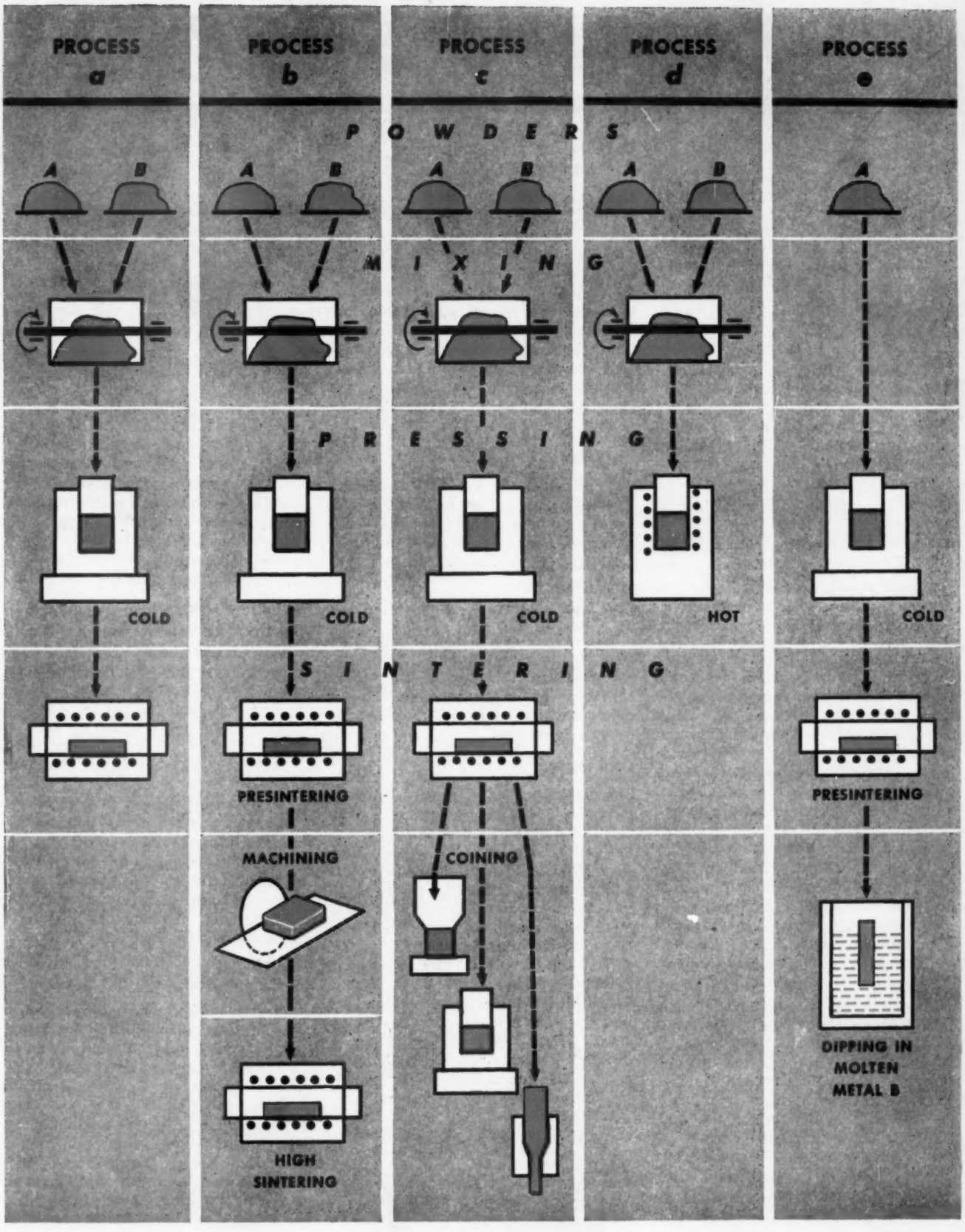
(This production method differs from all those described previously.)

STEP 1. Metal powder *A* (having a higher melting point than metal *B*) is pressed in the usual way at a fairly low pressure.

STEP 2. Sintering (presintering occurs under conditions which do not permit a high density of the material. The compact is more or less porous after sintering.

STEP 3. This porous compact (a framework of metal *A* powders) is dipped in the molten metal *B*. In this case, Metal *B* is not in powder form, but heated above the melting point to form a melt in which the metal *A* compact is dipped until all pores are filled with metal *B*.

This article will be included in the book: "Powder Metallurgy Principles and Methods," by Dr. Hausner, now in press by Chemical Publishing Corp.



FIVE METHODS OF PROCESSING TWO-POWDER COMPACTS

Two metal powders, A and B, may be compacted in these basic ways, using from two to five operations

TALKING SHOP

Too Much Bing

EXPLOSIVE RIVETS that have such wide use in aircraft and other lightweight structures where even a bucking midget or "mouse" can't get in, are expected to have only limited application in larger sizes. Above a ¼-in. rivet, they become pretty noisy. Of course, in some boiler shops, even a pound of TNT would produce only a faint pop.

Miles of Pyrex

TO DRAW the 1200 hot-metal samples daily at Ford's Rouge plant, more than a half-mile of 10-in. Pyrex glass tubes are used up. Samples are drawn with a sampling gun employing the tubes instead of the old pit molds. Two pieces of each sample are ground and placed end-to-end in a holder to pass a 35,000-volt spark for 45 sec. The heated sample radiates light, which is color-separated by a prism. Percentages of the various elements present are determined automatically by a photo-electric eye which magnifies the radiation 200,000 times, then measures intensity, rather than color, of the spectrum lines. Percentages of the various materials are recorded by a meter.

First Step

BEECHCRAFT'S SAFETY DEPT. has just painted the bottom step in each staircase white—an old idea but one that has avoided many a nasty fall. Reminds us of the fellow who mistook an elevator shaft for a stairway. Thereafter he warned friends to watch the first step, "because it's a heller."

Glamor Turbine

WISECRACKED one engineer recently regarding the place of the gas turbine: "It is the glamor girl of the power industry—more attractive then useful."

Batting for Controlled Atmosphere

ONE MAKER of small steel parts was suddenly required to heat-treat them after machining. Light carbonization was required, calling for equipment that couldn't be gotten for months. In the emergency, an old-fashioned process of pack-hardening was used—and delivered parts which didn't check when finish-ground. Parts were packed in equal parts of burned bone charcoal (corn kernel size) and hard-wood charcoal, then heated in a furnace for 16 hr.

Aginster

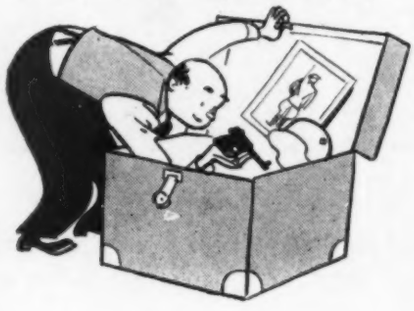
ONE MAKER of thermoplastics predicts doubled or tripled use in the next five years. Reasons: high chemical and heat resistance, improved insulating qualities, improvement in scratch resistance.

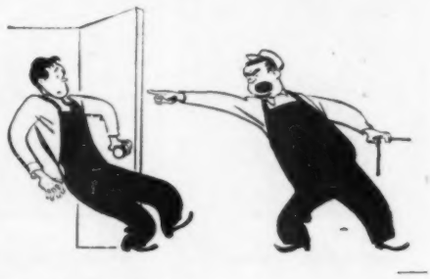
Hard Work

SAYS HENRY FORD II: "The reconversion battle is not going to be won by speeches. It is not going to be achieved by recriminations, newspaper battles, memoranda or essays, *but by hard work.*"

Boomerang

SOMETIMES collection beats production. In 1942 when Germany held most of Europe, Allied Military Intelligence discovered the French Underground could steal all of the 9-mm. ammunition it needed from the Germans, but could get no guns. No guns were available nor any production capacity, but the Mounties, as usual, solved the problem. They collected from Canadian veterans of World War I all the Luger pistols which had been brought home as souvenirs. The 3,000 pistols they collected were dropped by parachute to the Maquis, and the Germans have never known until now where they came from.





Draft Rejection

THE END plastic-molding press of a battery periodically lagged behind in production, although conditions appeared the same as those on the others. Finally the pressmaker was called in. After a quick checkup, the trouble shooter asked for a hammer and nails and proceeded to nail the door shut just beside the press. That door, opened only for ventilation, had been cooling the air by the end press.

Farmer-Mechanic

ONE OF OUR AGING shop-executive friends suggested that we start a machine shop in partnership. The germ of his idea was to put it in a small country town and to operate only for the six winter months and go fishing in the summer. This would be possible because the shop force would be farmers, who are very often ingenious mechanics because they have no one to call on for help. Latest evidence of the soundness of his idea is provided by the Dayton (Ohio) *News*, which reports that Farmer Lowell Boyer has built himself a complete machine shop. Prize units include a power hacksaw made from an old washing machine.

Hammer Feed

ENGINEERS testing such things have found to their surprise that the cause of wear and failure on tool bits is the "crowding" of the material against the sides of the cutting edge. Result: Tests of form tools cutting a wide face of a piece at once. The tool lasts indefinitely in such service, limitations being power available to turn the work and feed the tool. A recent application is a Carboloy-tipped refacing tool for extremely hard, 20 x 53½-in., chilled cast-iron rolls. The tool face was 6½ in. long and plunge-cut feed was by a wedge driven in with a hammer. The lathe was run at 15 sfpm. Life was ten times that of a chilled-iron tool.

LOAN TO BRITAIN

. . . Investment in World Economic Unity

CONGRESS should give swift and confident approval to the proposed loan to Great Britain.

Few other issues of foreign policy in the present troubled world lend themselves to such clear appraisal of where our National interest lies.

In simplest terms, the question is whether we should extend to Great Britain a credit of $3¾ billions (plus $650 millions in payment for lend-lease balances) in return for her promise to repay principal with interest over a fifty year period starting at the end of 1951, and her pledge to give the fullest possible support to the kind of world trading system which it is the declared policy of both the United States and the United Nations Organization to promote.

We Can Afford to Make It

The sum we hazard is not inconsiderable, but financial risks have meaning only when related to resources. The line of credit provided by the loan will amount, at most, to a claim on 2/5 of 1 per cent of our gross output for the five to six year period over which it may be used. The interest rate charged, while moderate, is higher than our Treasury is paying upon current borrowings. The risk entailed is well within our resources as a creditor. In the considered judgment of the American and British technical experts who thrashed through the intricate accounting for three painful months, the amount and terms offered will suffice to allow Britain, under rigid austerity, to relax her system of foreign trade restrictions, and to expand exports sufficiently to pay her debt commitments.

Against the considered risks of extending the loan, there must be weighed the certain costs of refusing it. Without the loan, Britain has no recourse but to maintain and extend the system of bloc trading which she adopted under stress of world depression and world war. If that is the route Britain follows, she will carry with her a large part of the sterling area countries – all British Commonwealth and Empire countries (except Newfoundland and Canada) plus Egypt, Iraq, and Iceland—and many of the nations with which the United Kingdom has payment agreements (Argentina, Bolivia, Brazil, Chile, Paraguay, Peru, Uruguay, Belgium, Czechoslovakia, Denmark, Finland, France, Netherlands, Norway, Portugal, Spain, Sweden, and Turkey).

Altogether, the United Kingdom's orbit accounts for more than half of the world's imports and exports combined. It likewise is crucial to the trade of the United States. In the years immediately preceding the war, the sterling area and payment-agreement countries provided just under one-half of both the import and export trade of this country.

Russia, of course, will continue to conduct her foreign commerce exclusively upon a state-trading basis. Before the war, the Soviet Union transacted only a little more than 1 per cent of foreign trade business, but its future sphere of influence will be large—conceivably embracing as much as 30 per cent of total international trade.

We Cannot Afford to Refuse It

If the weight of British influence in foreign trade is thrown toward the Russian pattern rather than toward ours, it is apparent that bloc trading, with all of is supporting devices—bilateral deals, exchange controls, import and export quotas, subsidies, currency manipulations and the like —will be the prevailing pattern for foreign transactions.

In self-protection, the United States would have no alternative but to conform to the dominant pattern. We should be forced to form our own bloc, and to enter into active economic warfare in bidding for trade concessions against the offers of our rivals. How well we would do this is problematical. To the game we would bring the largest economic potential in the world. But our handicaps would be equally impressive.

First, under a system in which political and economic motivations are inextricably fused, a democratic nation, and particularly one with a tradition of freedom in its domestic enterprise, would operate at a great disadvantage. We should inevitably be driven toward more and more government control of our entire economy.

Second, with a pattern of foreign trade in which our exports habitually are greater than our imports, our bargaining position in international trade is much weaker than our over-all economic strength would suggest. Under state-controlled trading we should still find it difficult to compete successfully without resort to loans, and under these conditions our loans would be supporting a system alien to our choice and interest.

Third, under a regimented system which made economic decisions subservient to political considerations, it is virtually certain that the volume of world trade would shrink. That was the clear experience of the nineteen-thirties. Thus, the

standard of living in the United States would suffer in common with all others, and we would be forced into a particularly drastic curtailment of certain war-expanded segments of our economy, at the very time when a large portion of the world is most in need of the products they can produce.

Weighing the Alternative Costs

In the years immediately ahead it is certain that from two-thirds to three-quarters of all international trade will be transacted either in pounds or dollars. If both circuits are linked in a determined effort to restore competitive world markets, to which buyers and sellers alike have access without discrimination, that will be the dominant system of foreign trade. If the sterling group with its satellites organizes a closed grid, our exclusive effort cannot preserve the trade pattern that we believe offers most to us and to the world.

No one can accurately measure the costs to the United States of refusing the loan and accepting the consequences. But unquestionably they would dwarf to insignificance the sum risked in the proposed credit. We would lose through the shrinkage of our trade, through the wrench of violent readjustments in our production patterns, and eventually through the curtailment of our over-all output below what it would be under an open rather than a closed system. We would lose heavily in economic liberty under a procedure that can be followed with success only by a close regimentation of production as well as trade.

Most of all, we would lose in prestige, through demonstrating that we are still unprepared to exercise a world leadership to which our giant stature as the possessor of almost half of the world's economic capacity entitles us. Once again we would be exhibiting to the world political feet of clay supporting an economic frame of heroic proportions.

It Is Far from a "Soft" Bargain

There has been some disposition in this country to regard the loan to Britain as a somewhat "soft" and generally unprecedented transaction that smacks of charity. This is the sheerest nonsense.

In the first place, the kind of economic system we want has never functioned and cannot operate now without a lender. For many decades prior to World War I Great Britain filled the creditor role. In 1913 her foreign investments totaled $19 billions, and she not only made such transactions pay, but they proved her salvation through two grim wars. Her credits helped in the industrial development of a large segment of the world, including the United States. Of all the nations in the world, only the United States can assume now the mantle which Britain no longer can support.

In the second place, the terms of our proposed loan to the United Kingdom are far from easy. Britain put a substantially greater proportion of her relatively meager resources into the war than we did, and dissipated a large share of her foreign holdings in the process while accumulating an outside debt of crushing magnitude. On a per capita basis her internal debt is greater than ours. Many Britons feel that our proposed loan is too small, and its terms too rigorous. If the amount proves to be inadequate, we shall have to consider supplemental aid at a later date. But the majority believe that the present offer gives a fighting chance to restore the system of world trade that we and they both want, and upon which the World Bank, the Monetary Fund, and the International Trade Organization under United Nations aegis are based. It is certain that without our loan all of this will go by the board.

In the third place, our proposed loan is far from being without precedent. Canada, which is linked by far closer economic ties to us than to the Empire, already has provided for a loan to Britain of $1,200,000,000. This amounts to almost a third of what we propose to lend, although Canada's population is less than 10 per cent, and her income is little more than 5 per cent of ours.

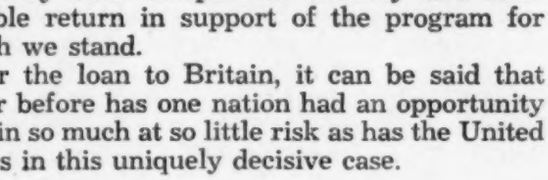
Shall the United States Lead or Follow?

The way to exercise leadership is to lead. Nothing could be more futile than to go half way toward establishing the economic order for which we stand, and then withhold the crucial measure that will make it work. Failure to approve the loan to Britain will be a clear default of leadership. Failure to approve it promptly will dissipate its effectiveness.

It has been officially stated that the British loan is a unique case that will establish no precedents for further credits to other nations. It is exceptional in its importance to our aim. But if the United States expects to make its economic program the dominant one for world trade, it must continue to exercise the creditor function without which that program cannot persist.

The most that we should ask is that future loan transactions be scrutinized as was this one to see that they offer comparable security and comparable return in support of the program for which we stand.

For the loan to Britain, it can be said that never before has one nation had an opportunity to gain so much at so little risk as has the United States in this uniquely decisive case.



President, McGraw-Hill Publishing Co., Inc.

What Causes Roll Failures?

BY S. C. SPALDING, METALLURGICAL ENGINEER, AMERICAN BRASS COMPANY

Although derived from experience in cold-rolling brass, these data on the mechanism of failure for forged and hardened steel rolls may be applied to other fields

FORGED and hardened steel rolls for cold-rolling brass (likewise other metals) are expensive. They are produced by forging an ingot, machining, heat-treating, and grinding to final dimensions. Their cost may range from several hundred to several thousand dollars, depending on size. So it is imperative that such rolls produce, or aid in producing, satisfactory tonnages of finished products, and this means being capable of several regrindings, and possessing characteristics which avoid spalling or breakage after a short service.

As a rule, forged and hardened rolls are made from special chromium steel of the following general composition: 0.85% carbon; 0.30% manganese; 0.30% silicon; 2.0% chromium, and 0.20% vanadium. The carbon content is kept near the optimum percentage to insure good depth hardening properties. Chromium adds hard carbides to the matrix. Vanadium inhibits grain growth, thus permitting a relatively high quenching temperature, which is required to get the necessary depth of hardness. This quality is necessary for two reasons: (1) to provide grinding allowance to compensate for any surface roughening, and (2) to withstand heavy pressure which breaks down and flakes off a thin case.

Three types of forged and hardened steel rolls should be considered: (1) rolls for finishing, (2) rolls for roughing and getting ready to finish, or as known in the trade, "breaking down and running down," and (3) rolls for backing up four-high or other backed-up mills. Hardened steel rolls are also used to a limited extent in grooved-rod rolls, and to a considerable extent in straightener and flattener rolls. This article is limited to the first three groups.

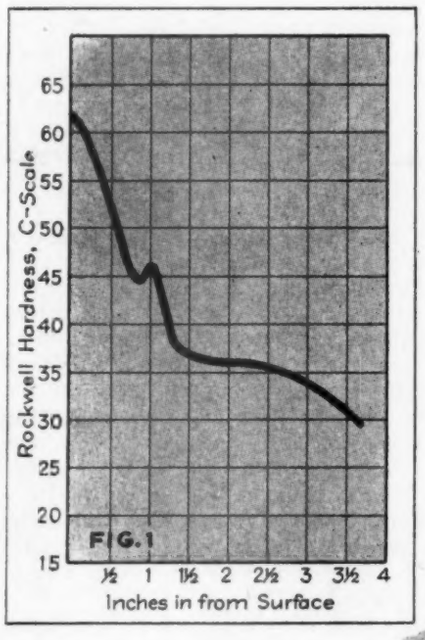


Fig. 1—To obtain suitable working hardness and a sufficient number of regrindings, the surface hardness for finishing rolls should exceed Rockwell 60 C

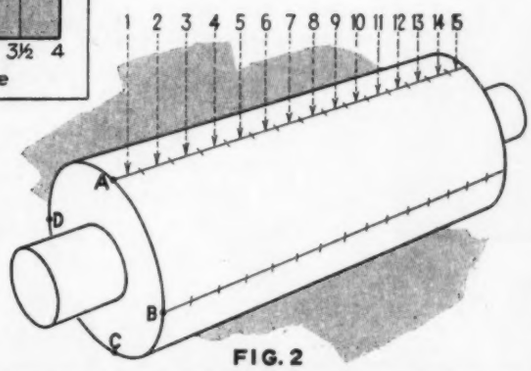


FIG. 2

Fig. 2—When received, and after each regrinding, the roll should be checked for suitable working hardness

Roll No. 8	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	99	99	97	98	98	98	98	97	97	97	97	96	95	95	95
B	99	99	97	98	99	99	99	99	98	98	95	96	96	94	94
C	98	98	97	97	97	98	97	98	98	98	98	98	97	96	95
D	97	98	98	98	96	95	95	96	97	97	97	95	95	95	95

Hardened finishing rolls are limited almost entirely to the rolling of cold metal in the form of strip or sheet, although some cold bar finishing is done. There are some differences of opinion about the desirable hardness of finishing rolls, but it is generally conceded that a new roll must not be under 95 scleroscope. A roll of 95 scleroscope hardness and up to 100, or better, is satisfactory. Fig. 1 is a typical hardness penetration curve.

A method of recording hardness tests of rolls is illustrated by Fig. 2. The roll is ruled lengthwise with four lines 90° apart. Each line is marked off in 2-in. intervals. Hardness tests are made along each of the four lines at the 2-in. intervals. The record gives a good indication of the distribution of hardness of the roll face.

When surface hardness of a roll is increased above 95 scleroscope, there

Fig. 3—Fully hardened finishing rolls are "tender"; cracks, as shown, or checks appear in the surface as the result of mechanical or thermal shock

is some sacrifice of toughness or ductility. Surface hardnesses of 100, or better, can only be obtained with rolls in the fully hardened state and having almost no tempering or strain-relief treatment after hardening. Hence, the rolling surface is "tender" and subject to checking and spalling under rough handling. For this reason, rolls furnished in high hardness ranges must be carefully handled and are not suitable for heavy reductions. Moreover, mechanical or thermal shock caused by foreign bodies being drawn accidentally through the rolls, or sudden generation of heat from excessive slippage between metal and roll, will cause surface cracks or checks.

When regrinding a roll, it is essential that all surface cracks be removed. As a safeguard, it is customary to etch the affected area with a 5 to 10% solution of nitric acid in alcohol, to show any remaining traces of cracks. If these are not removed, a few passes will serve to open them up again, resulting in marking of the metal being rolled. Aside from the bother of again regrinding, cracks not removed when first formed tend to grow, or progress inward, in a spiral path through the hardened layer, forming a progressive fracture under the roll surface. Finally, a point is reached where a portion of the roll surface falls out in a spall. Spalling of hardened steel rolls can come from several causes, but surface checks started in service, and not completely removed by subsequent dressing, will almost always cause it.

The mechanism of failure by spalling is as follows: Because of hardening, the roll surface is stressed to a certain depth in compression while the core is in tension. The compression stress of rolling, combined with the residual compression stress in the hardened shell, when concentrated at a surface crack, causes the crack to grow spirally inward. At the zone where the residual stress changes to tension, the crack or fissure grows rapidly in area. The notch effect resulting from this enlarged area of failure is sufficient to cause a sizable piece of the overlaying surface-hardened area to pop off.

The depth of the spall depends largely on the hardening of the roll. With shallow hardening the spall is shallow and occurs sooner than with deep hardness petetration. So it is desirable that the maker give the roll a considerable depth of hardness, because it permits a greater number of redressings, strengthens the surface and reduces the tendency to spall. However, there is a practical limit. If hardness is driven too deep the necessary core toughness is lost, and instead of spalling the roll will break into pieces under the rolling load.

The connection between roll failures by spalling and breaking in service, on the one hand and variations in hardening practice in the roll makers' plant on the other, is established by Figs. 6 to 9. These curves show the rate and form of hardness change from surface to center. These characteristics are, of course, intimately associated with roll composition and hardening practice. Study of these curves reveals they have certain similarities and certain differences. A common characteristic, with the exception of Fig. 7, is an inversion in hardness. In other words, the hardness of most rolls is above 60 Rockwell at the surface but falls at a rather rapid rate with increasing depth, until at a point about ¾ in. below the surface, the hardness trend reverses itself and the Rockwell readings go up about two points for a distance of ⅛ to ⅜ in., and then resume the original downward trend until the minimum core hardness is reached. In the case of Fig. 7, the roll has been deep hardened, the drop in hardness from surface to center being only from 63 to 59. In Fig. 8 the roll has been hardened simultaneously from the outside and from the central hole, and hardness inversion occurs in both cases, being more marked and nearer to the surface in the inside hardened zone. Fig. 9 shows only an arrest point in the curve at the customary point for the inversion, but appears to have a distinct inversion point at the unusual depth of almost 2 in. below the surface. This roll has also had some hardening effect through the central hole, as shown by the sharp rise at the end of the curve.

To summarize, while hardened steel rolls have common characteristics in that they drop in hardness from surface to center, have areas of reversal of hardness change and show certain maximum and minimum

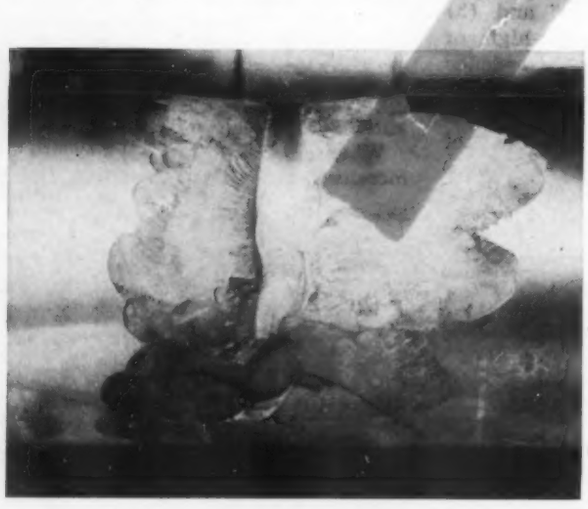
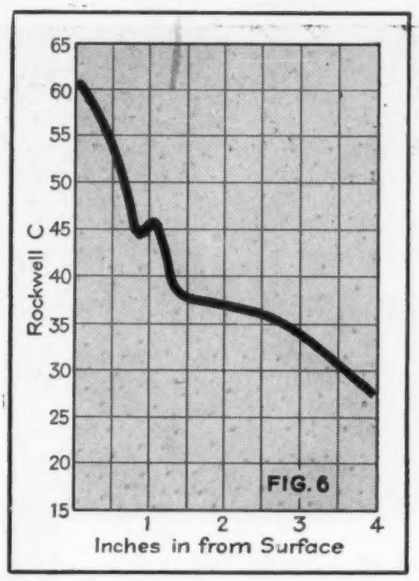


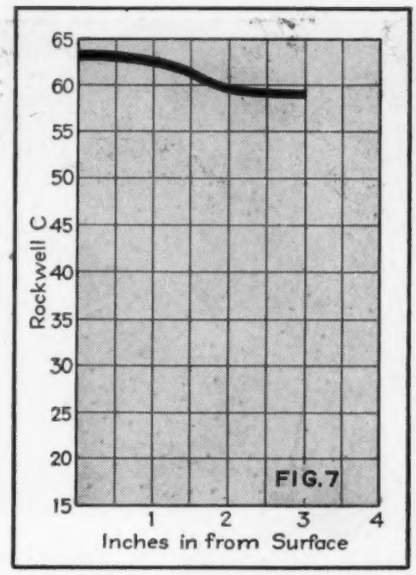
Fig. 4—Spalls originate from surface cracks, which grow spirally inward to the zone where residual stress changes from compression to tension, and here the notch effect causes a sizeable piece of the overlaying surface-hardened area to pop off. Fig. 5—A roll that is too deeply hardened tends to crush rather than spall

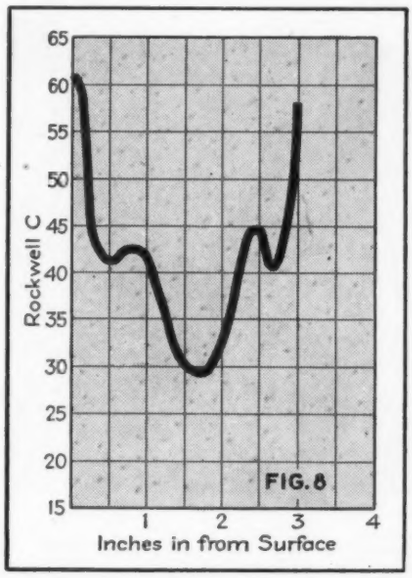
hardness figures, these phenomena are not consistent in rate, position or magnitude, and there is no uniformity of practice in regard to quenching or not quenching through the center hole in the roll.

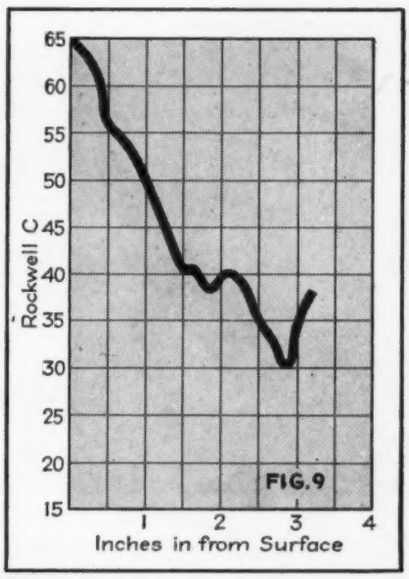
Thus a hardened steel roll, although it may have a surface uniform in hardness, is subject to many variations below the surface which can well affect its useful life. One of the most important of these internal variations is the hardness inversion area. As illustrated, this area varies in size and location; its approximate depth seems to coincide with the focal point of detachment of many of the spalls observed. It is also noticeable that spalls usually occur at a point where the original hardness has fallen to a point between 40 and 45 Rockwell. It is quite evident that they are connected with some structural change taking place during the hardening operation and come in the transition zone between full martensite and full pearlite. In Fig. 7, where the roll is martensitic throughout, the effect does not occur.

A theory, which seems to fit the case satisfactorily, is that this area in the roll corresponds to the zone at the nose of the *S* curve on isothermal transformation diagrams for transformation products formed in this range. Fine lamellar pearlite is formed at the upper temperature



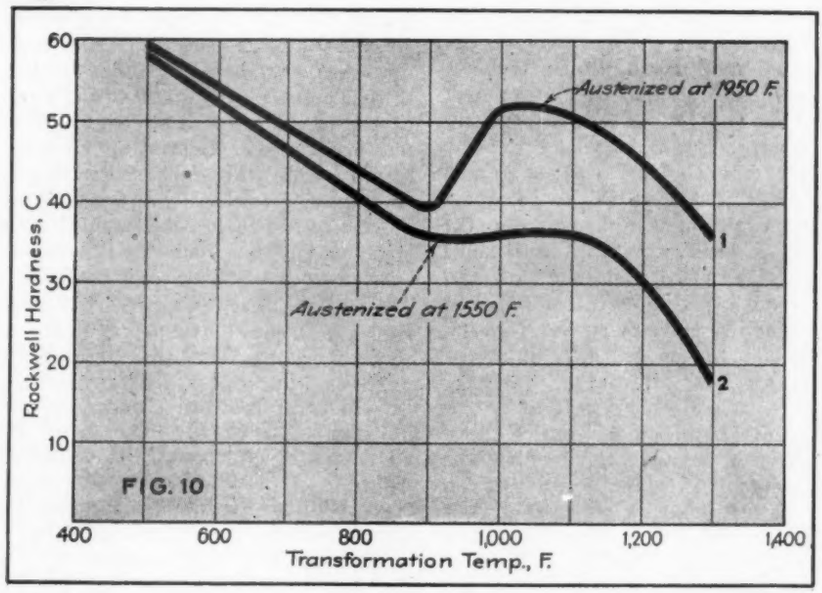






Spalling and breaking of finishing rolls are affected by the rate of hardness change from the surface to center. Fig. 6—Typical hardness curve, showing inversion of hardness at a point less than an inch below the surface. Fig. 7—There is no inversion in the case of this deep-hardened roll. Fig. 8—Hardness inversion occurs twice, when a hollow roll is hardened from the inside as well as the outside. Fig. 9—In this case, the usual rate of hardness change did not apply: inversion occurred only 2 in. below the surface, possibly as the result of hardening effect through the central hole

Fig. 10—Hardening temperature has a definite effect on hardness reversal, and the higher the austenizing temperature the greater the intensity (SAE 52100—1.02%C, 1.41%C)



Figs. 11 and 12—A central hole in a finishing roll is often a source of failure

stages of this range; coarse bainite at the lower temperatures of the range. In the area of the knee of the curve, there is a mixed structure of fine lamellar pearlite and coarse bainite. Which structure predominates in the effect on the final hardness of the aggregate structure depends on such factors as composition, austenitizing temperature and hardening technique.

The effect of composition on hardness reversal can be seen by examination of the *"Atlas of Isothermal Transformation Diagrams"* published by the U. S. Steel Corporation. Some of the compositions do not show the effect at all; others do have it to a greater or lesser degree. It is also evident that the austenitizing temperature or hardening temperature in the case of a roll has a very definite effect on occurence and magnitude of hardness reversal. With low austenitizing temperature, say 1500 F. and below, the phenomenon practically does not occur in any of the steels, but as the temperature of austenitization is raised, the reversal occurs in steels which are susceptible and becomes greater in intensity the higher the temperature used. This effect is illustrated by Fig. 10, which shows a chrome steel austenitized at 1550 F. and 1950 F. The increase in intensity at the higher temperature is readily seen. Evidently the area of mixed structures and reversal in hardness of the isothermal transformation diagram is identical with the area of hardness reversal found in hardened steel rolls. Therefore, it is believed that when a roll spalls, the location is likely to be in this zone of mixed structure and hardness reversal. Whether a roll is susceptible or resistant to spalling under service abuse (barring other evident causes such as steel defects) is related to the location and nature of this zone of mixed structure and stress reversal below the roll surface. Positive control of the location and nature of the mixed structure might have a distinct bearing on the susceptibility of some rolls to spalling as compared with others.

Some rolls are hardened from a central hole as well as from the surface. This practice has always been questionable. Except for rolls 6 in. in diameter or under, the maker usually prefers to put a hole through them. From his viewpoint the hole removes that portion of the ingot which is most likely to be defective, and gives him better mass and stress distribution in hardening. The hole also enables him to inspect for internal pipes and porosity.

Central Hole Undesirable

From the user's standpoint, the central hole is undesirable. Failures often originate from the central hole, as illustrated in Figs. 11 and 12. Theoretically, the metal in the central area adds little strength to the roll in bending under compression loads such as exist particularly in four-high mills, and the hollow bore provides a point of flexure and consequently a source of fatigue failure. As a general rule, American Brass Company prefers to have rolls furnished solid and accepts them with a bored hole only when the roll maker insists on its necessity. There are some exceptions; for example, where the hole is required for cooling.

Microstructure may be irregular in hardened steel rolls. The aim of the roll maker is to process the roll from the ingot onward, by suitable hot workings and normalizing and annealing treatments, so a uniform structure will result. This is done not only to insure the production of rolls of good quality, but to safeguard the manufacturer from losses in hardening, as irregularities or poor structural condition of the forging at that point greatly increase the risks of trouble in hardening. Fig. 13 is a photomicrograph illustrating the fine-grained uniformly martensitic structure usually found in hardened steel rolls. Figs. 14 to 16, show undesirable structures of progressively coarsened martensite from three rolls that failed.

As stated earlier, hardened steel rolls are essentially tender even when they have the best grain structure, as shown by Fig. 13. Coarse martensitic structures indicating over heat in hardening, as shown in Figs. 14 to 16, definitely increase the fragility of the roll, and make it subject to ready failure from mechanical or thermal shock. An occasional microstructure, which also greatly weakens the roll, is illustrated by Fig. 17. In

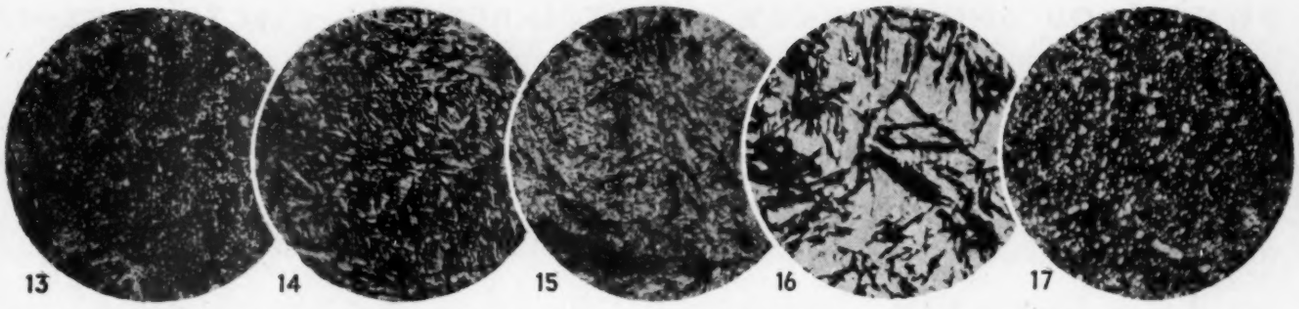


Fig. 13—A fine-grained, uniformly martensitic structure is usually found in properly hardened steel rolls. Figs. 14 to 16—Undesirable structures of progressively coarsened martensite, as seen in rolls that failed. Fig. 17—Segregation of excess carbides at boundaries of large grains makes paths for cleavage

this "grain boundary" or "envelope" structure, the excess carbide particles, instead of being uniformly distributed through the martensitic mass, as in Fig. 13, have segregated to the boundaries of large size grains left from prior hot working operations. These grain boundary segregations make paths of cleavage or weakness in the roll and lead to early spalling or breaking. In properly made rolls they are eliminated by proper hot working and normalizing and annealing operations before hardening.

So far, the problems encountered with finishing, or Group 1, rolls have been considered. In the case of breaking down and running down rolls, Group 2, polished surfaces are not required and are often undesirable. The principal requirements are great strength and toughness to withstand the heavy pressures and thermal and mechanical shock. Heavy reductions are the rule, particularly on breaking down work taken on bars and billets with rough surfaces. If hard rolls of the Group 1 type were used, excessive slippage would occur. In fact, failure to bite on heavy pinches would result and the hard surface of the rolls would soon crack and spall. In rolls of Group 2, therefore, the hardness requirements are reduced to the range from 60 to 85 scleroscope. For very heavy breaking down work, the hardness preferably ranges from 60 to 65, with perhaps 70 to 75 for heavy running down, and 80 to 85 for the lighter running down work. For general all-around work, where break down and run down operations will be done on the same roll, 70 to 75 scleroscope is perhaps the best average hardness range. With these lower hardness ranges, rolls of great strength and toughness are obtained but they mark up and wear rapidly. This means fairly frequent grinding and removal of more stock than with hard rolls.

The standard chrome roll steel listed earlier is not suitable for Group 2 rolls. This steel characteristically develops a shell of high hardness and limited depth surrounding a softer tough core. For the Group 2 rolls moderate hardness to great depth is needed to support heavy pressures and permit considerable reduction in diameter by grinding without appreciable change in hardness. This is accomplished with a steel of lower critical hardening rate and capable of being hardened by oil or even air quench. In general, suitable compositions have lower carbon and higher alloy content. Chromium, molybdenum, nickel and vanadium, either all together or in combinations of two or three have been used.

Reaction to Abuse

Reaction of Group 2 rolls to abuse is as follows: Being lower in hardness they will stand up under thermal changes that wreck hard rolls. Local friction from slippage produces severe surface cracks and spalling in the hard rolls, but is absorbed by these softer rolls without damage. Spalls in Group 2 rolls are more likely to be caused by excessive local pressure, as from a foreign body going through the rolls or other overload, which breaks down the structure at some weak point below the surface. True spalls are likely to be larger and deeper seated in character. Local dents and small holes may develop without doing progressive damage and can readily be removed by grinding. Continuous overpressure, caused by miss sets or trying to reduce metal in too few passes, will cause failure by breaking, usually transverse through neck or body in two-high mills, or by crushing and breaking into many pieces in four-high mill rolls. Here, it is an advantage to eliminate central holes.

Group 3, or backing-up rolls, have requirements somewhat similar to Group 2 rolls and are made to similar specifications for composition and hardness. The hardness is usually kept to the upper side, averaging perhaps 75 to 80 for best all-around performance. These rolls usually require only an accurately ground surface; a polished surface may be a disadvantage, particularly if driven by friction from the work rolls.

Avoiding Spalls

These rolls always run in line. They are in contact with hard work rolls so that high surface pressures are built up, resulting in fatigue and eventual shelling or spalling of the surface. The spalls are different from those previously described, since they start by dropping or shelling out of small particles. When neglected, these small holes can develop into large spalls. If the rolls are reground at proper intervals to remove the surface-fatigued metal, such spalls should never get beyond the incipient stage. Usually the surface of the lower backing roll deteriorates faster than the upper because chips fall upon it.

With overloading, these rolls usually break in the necks. Backing rolls are made as solid one-piece rolls and two-piece, where a sleeve representing the central or body portion is shrunk onto an arbor. Sleeve rolls have the theoretical advantage of allowing the sleeve to be replaced when worn out. This advantage is based on the presumption that the arbor is of such design and strength that it will stand many remountings of sleeve bodies. If the arbor breaks in the journal, as does happen after one or two sleeves have been installed, the advantage of the sleeve-type roll tend is nullified. As a general rule, sleeve-type backing rolls would not be considered in sizes much under 36 in. in diameter. In sizes above this figure the question must be decided on individual experience and conditions.

The Thyratron

THYRATRONS are the second group of grid-controlled electronic tubes. They have one distinctive feature. In thyratrons the envelope is gas-filled instead of using a high vacuum as in the pliotron. Mercury vapor, argon, or xenon is used.

Otherwise the thyratron is basically a three-element tube, having an anode, a cathode, shown here as an indirectly heated cathode, and a control grid. The control grid is usually connected by its supports to the terminals in the base.

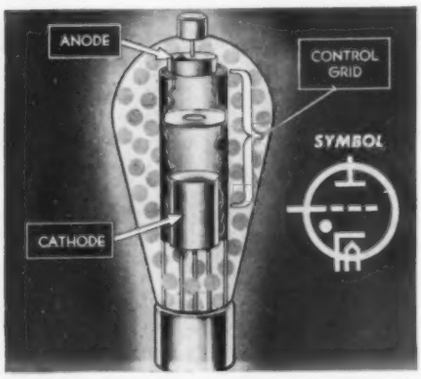
The control grid is usually made of sheet metal and is composed of both a sleeve, which surrounds the cathode and anode, and a disk with a single hole, placed between them.

The presence of gas in the tube enables the thyratron to handle larger currents at lower voltages, just as gas gives the same performance in the phanotron tube. The gas in the tube also limits the control of the grid to starting current flow in the tube. Once the thyratron has started passing current, the grid becomes ineffective, that is, it can no longer stop or control the flow. This means that the grid control in a thyratron is more of a trigger-action, as compared to the pliotron with its smooth, even throttle-valve action.

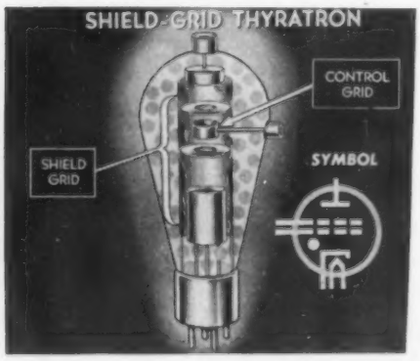
The area of the grid which serves to control electron flow is the area surrounding the opening in the disk, which by its negative charge repels electrons. The balance of the grid serves only to shield the electrons at the cathode from the attraction of the anode.

In an improved form of thyratrons these functions are divided, giving us the shield-grid thyratron, which has two grids, a "shield grid" and a small control grid.

The shield grid incloses the cathode almost completely except for an opening directly between the cathode and anode. It usually has a second disk or partition which shields the control grid from the anode. The small control grid guards the opening from the cathode and serves to trigger the flow of the electrons and of current. In actual practice the shield grid is usually held at or near cathode voltage. This means that only the voltage of the small control grid needs to be varied to start current flow.



The thyratron is a three-element tube which uses a gas-filled envelope instead of a high vacuum



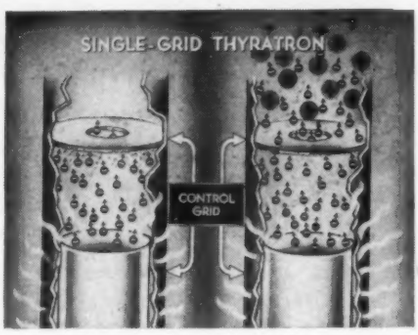
The shield-grid thyratron has a small control grid and a shield grid which almost completely incloses the cathode

Control of AC Power

Now, let's see what advantages the two grids of the shield-grid thyratron offer over the performance of the single-grid thyratron.

In the single-grid thyratron, the grid has no protection from contamination by the active material being evaporated or bombarded from the cathode. Nor, has it any protection from the radiant heat of the cathode, which might raise its temperature sufficiently to cause the grid itself to emit electrons.

By comparison, in the shield-grid thyratron, the disks in the shield grid protect the control grid from the direct arc stream and also protect it from much of the heat and contamination from the cathode and mercury.



In the single-grid tube, the control grid has no protection from the material being bombarded from the cathode nor from the radiant heat of the cathode

Hence, the small control grid, being better protected and insulated, requires much less power for reliable and consistent operation than the grid of an equivalent single-grid thyratron. This ability to control large currents in response to feeble control signals makes it possible to operate shield-grid thyratrons from even the small amount of power obtained from the photo tube.

Industrial Uses

The above characteristics of thyratrons are applied in electronic welders, and provide a precise amount of current necessary for welding minute and delicate parts.

In electronic motor control, thyratrons provide a smooth adjustable flow of power for both motor armature and field.

Combined with photo tubes and pliotrons, thyratrons are performing many jobs for industy. We find them used in the highly sensitive spectrophotometer which can detect and record more than two million different colors and in precision equipment used for color register on fast moving multi-color printing presses.

Working with saturable reactors, thyratrons regulate the flow of power to electric furnaces and so maintain constant temperatures.

In resistance welding, as in the seam welding of the top of a streamlined railroad coach, thyratrons are used to time accurately the application of the huge currents supplied through ignitrons.

Based on a sound slidefilm in the General Electric industrial electronics course.

Practical Ideas

HAVE YOU A PRACTICAL IDEA?... If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Magnetic Lathe Chuck Has Great Strength

ROGER WESTCOTT

Some years ago I built an electromagnet for a physics laboratory demonstration from a kit offered by one of the leading scientific supply houses. Its extraordinary strength and simple design soon suggested many shop applications. Here, I would like to describe an efficient lathe chuck made from it.

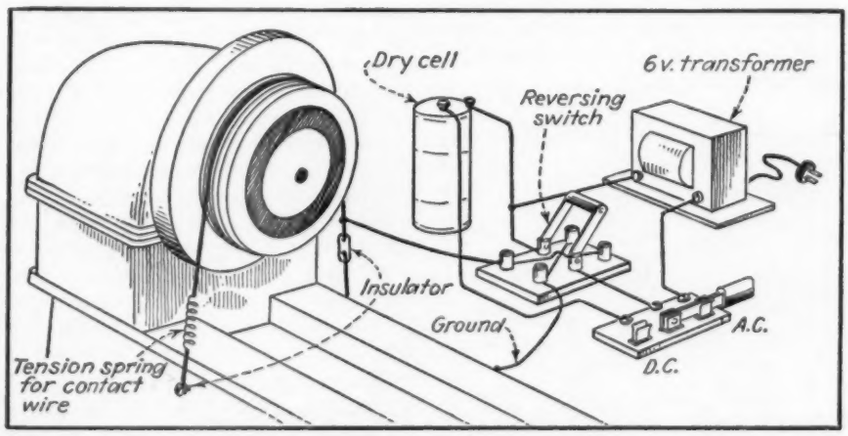
The magnet is of 4-in. diameter, and experimentally was bolted to the faceplate of my 6-in. lathe, carrying the flashlight cells right around with it. Intended to be spectacular rather than efficient, the demonstration model would operate from a single "pen-lite" cell and lift over 500 lb. (I never did test the maximum.) Of course, the current drain was heavy and one such cell would last only a few minutes.

The idea has received a lot of thought and now here is a much improved version. First of all, the same kit could be used, if it is still available, otherwise, obtain a suitable piece of iron. Considerable care should be used in selecting the material; it will cost only a dollar or so, which may seem high for the weight involved, but ordinary cast iron and many steels are practically useless magnetically. A solid block of high-permeability iron (which is equivalent to a very low magnetic resistance) about 1 in. thick should be used. If this is unavailable, the core can be built up out of thinner pieces provided all surfaces are lapped to the most perfect contact possible. It is very important to get the best iron possible because there is a very definite saturation point beyond which no amount of current will increase the magnetic force, and an efficient magnet should operate somewhat below this saturation point or it will just overheat. This is the most important factor in the design. Second, the physical dimensions of the iron with respect to the coil cavity should be carefully worked out to best utilize the force. If the proportions are wrong, some parts of the iron will magnetize more than others and some of the power will be dispersed passing through air. The outer ring makes one pole and the solid center core is the other; both should have the same area so the magnetic current will be uniform everywhere. The coil should be no larger than absolutely necessary in order to produce the right ampere-turns, and the cavity should just fit the coil with the least air space possible. The drawings show a magnet of approximately the correct proportions but it is by no means to scale.

Because this is a small magnet, it has only one coil and two poles. Its T-shaped cross section and circular outside shape make the most efficient two-pole electromagnet possible, far better than a horseshoe magnet for lifting or flat holding purposes. (This is very similar to the design used for large magnetic cranes.)

The coil can be designed to use any source of low-voltage D.C. you wish, such as storage batteries or dry cells. One simple and inexpensive method is to use a door bell transformer (6 volts) and a single-plate dry-disk rectifier which allows the current to flow in only one direction.

It may be necessary to wind several coils of various-diameter wire to find out which will do the job best, but for 6 volts and a 4-in. magnet, number 32 A.W.G. enamelled copper ought to be pretty close to the right size. Electrical data for copper wire can be found in any of several handbooks. The easy way to wind these coils is to make a wooden mandrel just a trifle larger than the core of the magnet and slightly tapered. The coil can be wound in a lathe and built up, layer after layer, until its outside diameter will just clear the inside of the ring.

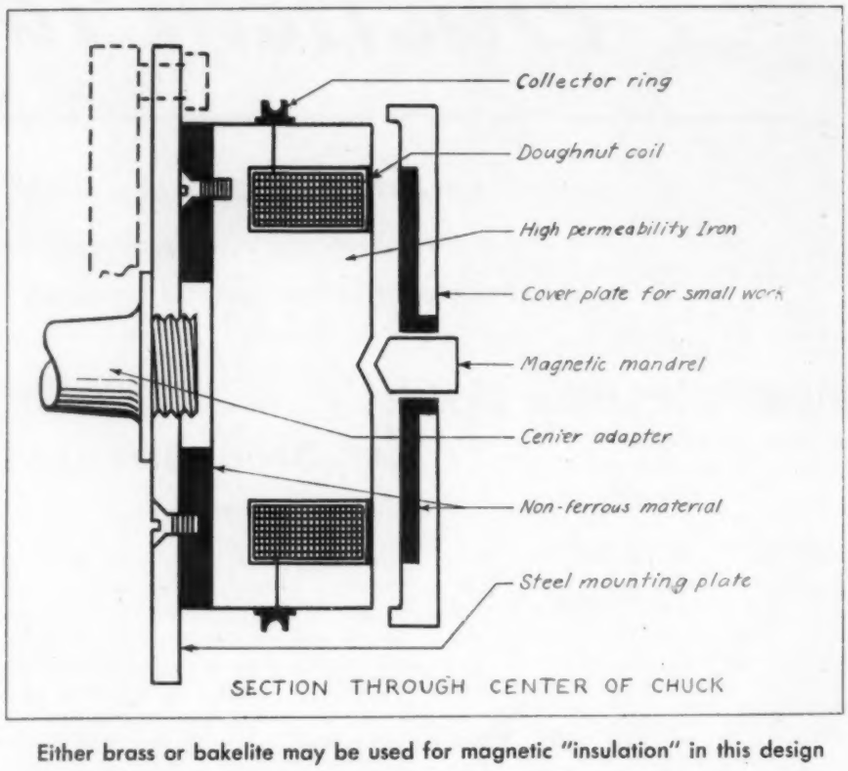


Slip ring pick-up makes a small electromagnet independent of its power supply so it can be used as a lathe chuck

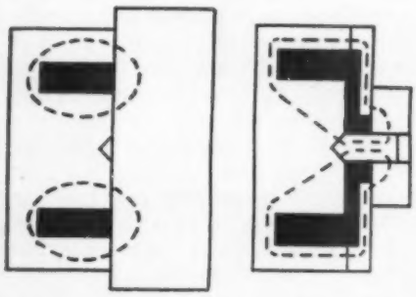
The wiring diagram combines two different types of hookups, either of which will suffice and there are several more that are possible. The important thing is to provide some way to reverse the current rapidly in order to remove the work because just shutting the current off won't do any good. The residual magnetism will still be about 50% until the current is reversed a few times, changing the polarity back and forth so the magnetic force won't have time to build up in either direction.

The mounting for the lathe may vary according to individual preference and the type of lathe. A step-collet would be excellent, for instance, but an important consideration is to use some non-magnetic material between to confine all the force where it's wanted.

I think the 4-in. diameter is about right for a small bench lathe of about 9-in. swing because it is big enough to hold any work from 4 in. up to the full swing, and adapters can be built to narrow the magnetic circuit for holding small work. Shown is a magnetic mandrel, which fits a 120° center, and a plate for holding small tubular parts. Note how the brass insulation confines the magnetic flux, forming a closed path through the work.



Either brass or bakelite may be used for magnetic "insulation" in this design



Dotted lines show magnetic paths for both mandrel-held and large work

After the coil is in place with one lead soldered to the collector ring and the other grounded, some sort of a cover plate should be fitted to protect the coil against chips, oil and grease. This can be a copper or brass ring, or sealing wax, or a low-temperature melting plastic.

Quick-Acting Trimmer Has Semi-Automatic Operation

JOSEPH BUDNICK

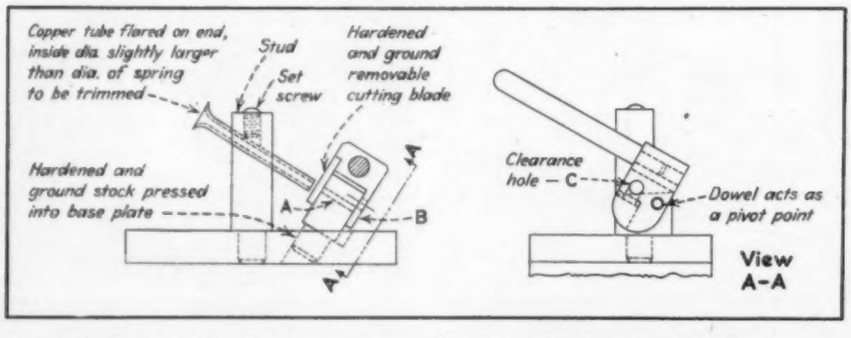
Occasionally, every production shop is confronted with the problem of devising a simple tool to trim small lengths of thin wire, springs, or small tubes to a certain definite length in quantity production.

In our case we had a million springs 0.010 in. diameter wire, ⅛-in. O.D. and ¾-in. long which had to be trimmed to length of ⅝ in.

The tool described below, which I have designed on several different occasions, is very efficient in quick loading, trimming, and ejecting these pieces automatically and a production of 3,000 pieces an hour can easily be attained.

The tool works as follows: Two or three springs at a time are loaded into the flared opening of the copper tube and fall by gravity down the tube against the cutting blade which acts as a stop in its lowest position. As the blade is raised, one of the springs falls into the hole marked "A" of the hardened stud shown, and is stopped by the side "B" of the clevis, which side acts as a stop when the cutting blade is in its raised position and sets the actual length of the trimmed spring, in this case, ⅝ in. As the cutting blade is lowered down again and cuts the spring, a clearance hole "C" in side "B" is brought into line with hole "A," and the spring falls out.

The cutting blade must be made removable, as it then can be easily sharpened and will actually be stronger than if made in one piece. Hardening a small blade is easier, too.


Copper tube flared on end, inside dia. slightly larger than dia. of spring to be trimmed
Stud
Set screw
Hardened and ground removable cutting blade
Hardened and ground stock pressed into base plate
A
B
Clearance hole — C
Dowel acts as a pivot point
View A-A

Length control in this trimmer is governed by the base lock thickness

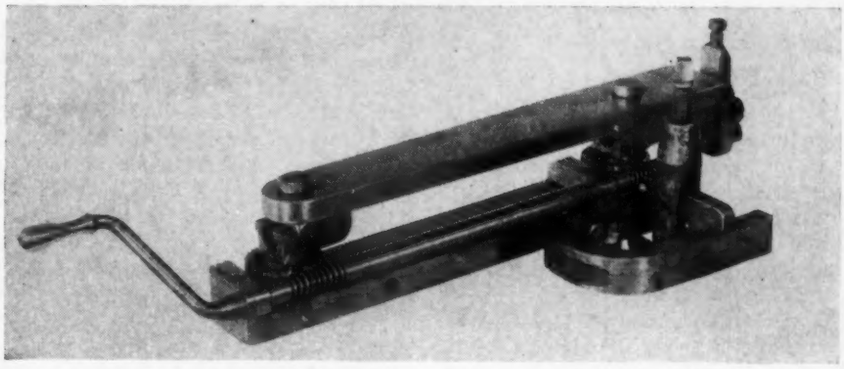
Parallel Bar Radius Tool Has Wide Cutting Range

A. JESCHKE

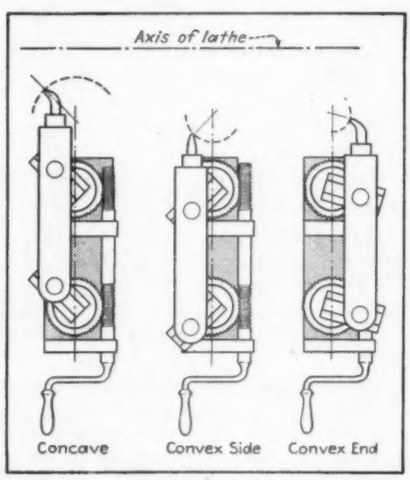
Using two worms to turn two cranks, parallel motion is obtained on the upper bar permitting the toolholder to project well clear of the driving mechanism. Thus, convex and concave radii are possible right down to zero in practically any angular position. This design also makes the tool adaptable to shaper work for cutting complicated circular moldings with ease.

Radius setting is accomplished in less than 30 seconds by loosening the two shoulder screw-crank pins and moving the nuts up against a depth gage placed in turn in the groove in each of the cranks. This is the only radius adjustment; the carriage can be moved to any position and the vertical tool feed will place the bit wherever it's needed. The toolbit has parallel motion for a full 360°. One semicircle will be convex cutting and the other concave, and the limits of either semicircle are determined only by the position of the toolbit. The toolbit must be ground with a circular point because the radius of the cut is always either the sum or difference of the crank radius and the toolbit radius (see cut) and the point of tangency advances along the contour of the toolbit as the tool traverses the work.

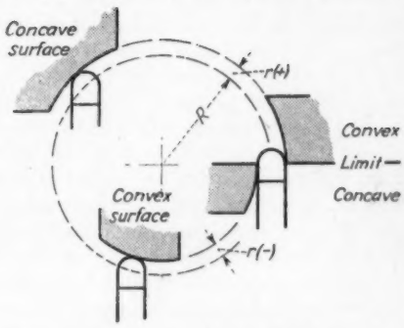
Because the tool can work in any position (using the three lathe feeds, as well as its initial placement on the compound) and the toolbit itself can be adjusted to any angle relative to the parallel bar axis, an almost unlimited range of work is possible. For instance, with a slender hooked-point tool, it is quite simple to turn the most intricate inside spherical and similar curved surfaces provided that the opening in the work is slightly larger than the inside radius to be turned.



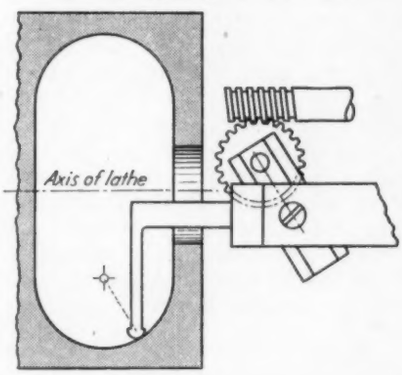
U-strap mounting permits quick adaptations to lathe or shaper

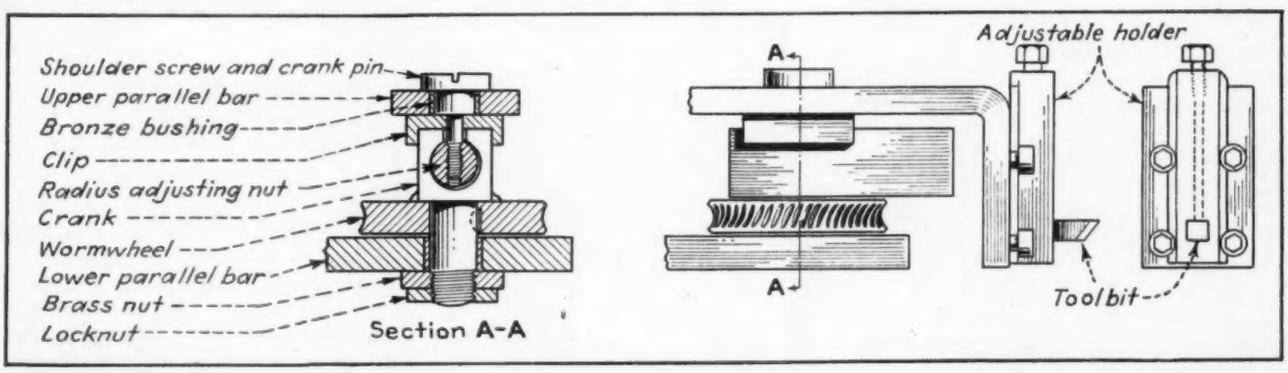


Three typical tool positions showing the simple transition from convex to concave work. If the cranks and toolholder are high enough to clear the worm shaft, continuous 360° rotation is possible and the tool itself can be turned to any position as well



Using a circular-tipped toolbit, the cutting radius is the sum of the crank radius and toolbit radius for concave cuts and the difference for convex. A wide range of internal spherical cuts through narrow openings are also within the capacity of the tool





Details of toolholder and construction section through the center of one crank. Note that with the crank at zero angle with respect to the lower bar and the radius set at zero, the toolholder clears the end of the crank

Non-Magnetic Angle Plate And V-Block Fixture

LEE L. DODDS

The operating principle of so-called non-magnetic grinding fixtures on surface grinders seems to be a deep dark secret to many toolmakers and machinists. The attempts of some of them to construct such fixtures are sometimes amusing. A case in point occurred in a mid-west tool and die shop several years ago.

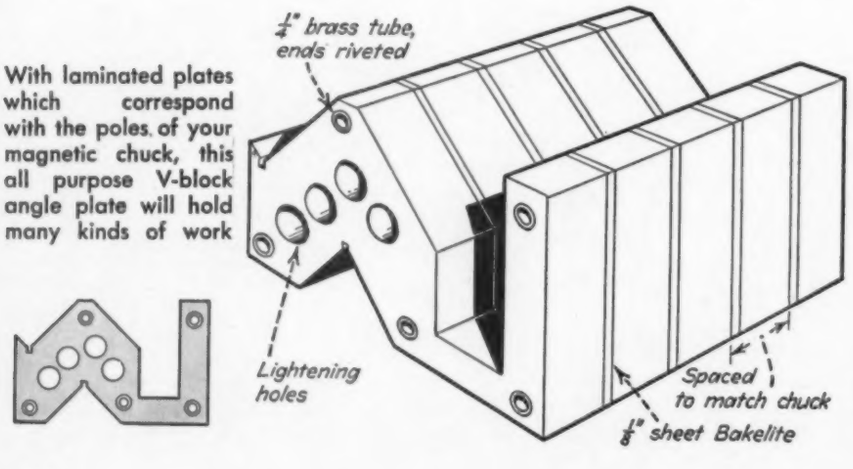
A toolmaker spent several days machining a pair of tool steel parallels 1x3x15 in. and then proceeded to drill a number of ⅝-in. holes in them and sent them to be hardened. In the meantime, he cut a number of ⅝-in. diameter brass plugs. It was then my curiosity got the better of me and I asked him what he was making. He showed me his shop order and said he was making a pair of non-magnetic parallels. I didn't have the heart to tell him the truth, but just bet him $5.00 that they wouldn't work. They didn't.

The accompanying sketches show how to make a non-magnetic angle plate and V-block grinding fixture, on which V-blocks of any size can be ground on all surfaces accurately. The term "non-magnetic" is not exactly true, for the plates do become magnetized when they are placed across the poles of a magnetic chuck. The only way the fixture will hold a piece to be ground, is to place the fixture on the magnetic chuck with each of the steel segments on a separate pole of the chuck. The fixture then acts as a binder between the chuck and the piece to be ground.

The fixture illustrated can be made any size desired and the dimensions are not at all critical. It is only necessary that all angles be accurate and contact surfaces flat and smooth. Select a piece of tool steel slightly larger than the completed fixture and rough machine it in the shaper or miller. Then drill the rivet holes and weight reducing holes, slightly countersinking both ends for riveting. Measure the center-to-center distance between poles of the magnetic chuck on which the fixture is to be used and saw the piece into plates ⅛ in. narrower. This ⅛ in. is to allow for the thickness of the bakelite or brass insulators between plates. Do not use fibre for magnetic insulation as it is water absorbent and will tend to swell and will, in time, distort the fixture and render it useless. Cut the bakelite plates with a hacksaw and drill them, using one of the steel plates as a jig. Harden the steel plates and grind both sides to make a neat joint when assembled. The rivets may be made of any non-magnetic metal and may be either solid or tubular. The latter is preferable, as it is lighter. After assembling, it might be well to true up the fixture on the miller or shaper. Finally, grind all surfaces true to angle.

The angle plate feature of this fixture will come in handy on many jobs in the tool room. In using it this way, be sure always to lay a brass parallel under the work. If the work piece touches the chuck, it will short circuit it and will not energize the fixture.

In finish-grinding the fixture, it may be placed directly on the chuck, with a flat piece of steel laid against one side, to close the circuit through the plates of the fixture and hold it securely.

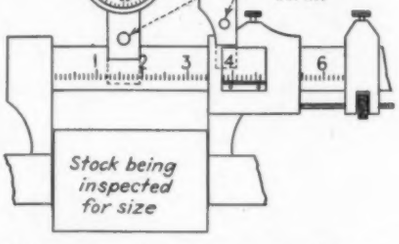


With laminated plates which correspond with the poles of your magnetic chuck, this all purpose V-block angle plate will hold many kinds of work

Dial Attachment For Vernier Calipers Aids Inspectors

EDWARD C. NIEDT

Every morning we had the job of inspecting large numbers of worm and wormwheel blanks which had been turned out by the night shift. Limit gages were impractical for this work because it was necessary to sort the rough blanks according to size within a total range of 0.010 in. Vernier calipers were used at first, but they proved slow, and eye-strain on a long job like this was severe.



This simple dial gage clamped to a vernier caliper makes inspection work easier and faster while reducing eye strain at the same time

This attachment operates like a comparator; the vernier is set to the size shown on the drawing and the dial adjusted to zero. Then readings are obtained from the dial as the vernier gages each piece in terms of the variation, plus or minus, from the nominal size.

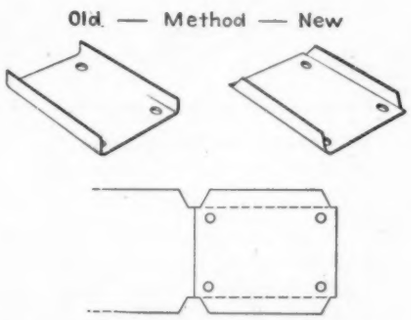
As a comparator, the attachment can be used in the manner shown, or clamped to the blade itself to read directly. Either way it should find many uses in every shop.

Design Change Simplifies Blanking and Bending

H. R. HAGEMAN

A minor instance of the advantage in cooperation of engineering and die making departments is shown by the improved method for producing the small channel part shown in the drawing the original design at "x" and as modified at "y." Originally the progressive pierce and cut-off method was used to produce the flat

rectangular parts which were afterward formed into a channel shape by feeding one by one into the forming die. In order to combine the forming with the two preceding operations, permission was obtained to bevel the corners as shown on the finished part at "y." The stock in process being notched at the piercing stage as at "z" makes the cut-off and form operations very simple. Carboloy liners inserted in the forming section prevented excessive wear and galling and a hitch feed enabled finished parts to be turned out almost as rapidly as the blanks were originally, thereby providing a modern method and corresponding savings.



Beveling the corners during blanking permits bending this part into a channel immediately, thereby eliminating an extra operation

Grinding Fixture Removes Teats From Lathe Parts

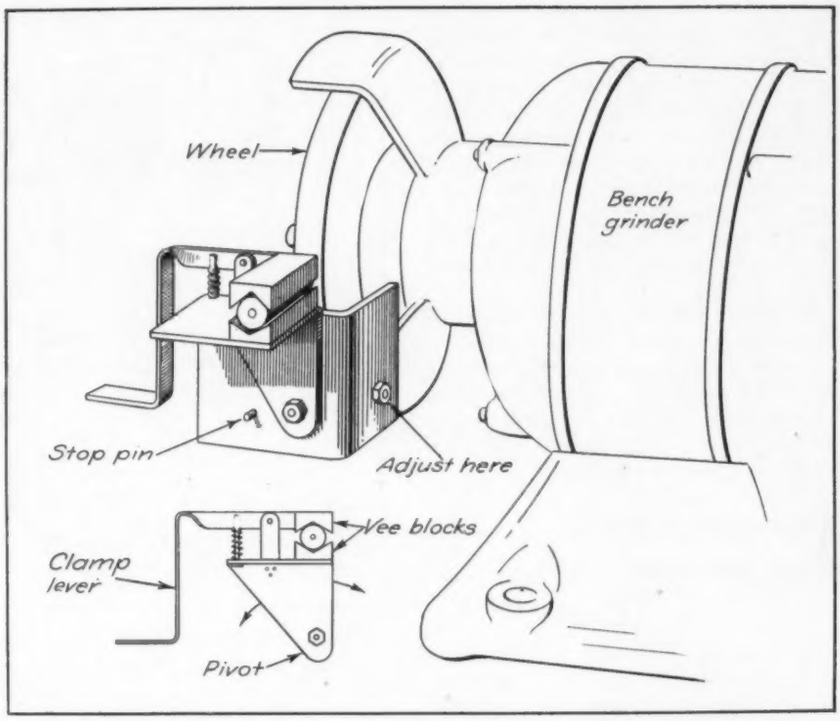
JOHN S. CURTISS

Parting tools, especially in production work, leave teats which are customarily removed by hand grinding. This is slow, tiresome, and the results are likely to be somewhat hit or miss.

I have a fixture that is bolted to left end of a bench grinder which speeds this removal job about 300% and at the same time practically eliminates the human element.

The toolrest is removed and an angle bracket substituted. To the bracket is fastened a plate carrying a pair of sprung V-blocks and this assembly is arranged to swing in an arc across the edge of the grinding wheel. The lower V-block is permanently mounted but the mating upper block is on a spring lever which is depressed to open the jaws for unloading and loading.

The single holding screw is located so the device will hold the work at the right height to dress it square across, and a stop is included for positioning the work against the wheel. Adjustments are made by tapping the whole fixture inward when the holding fixture is loosened a trifle.



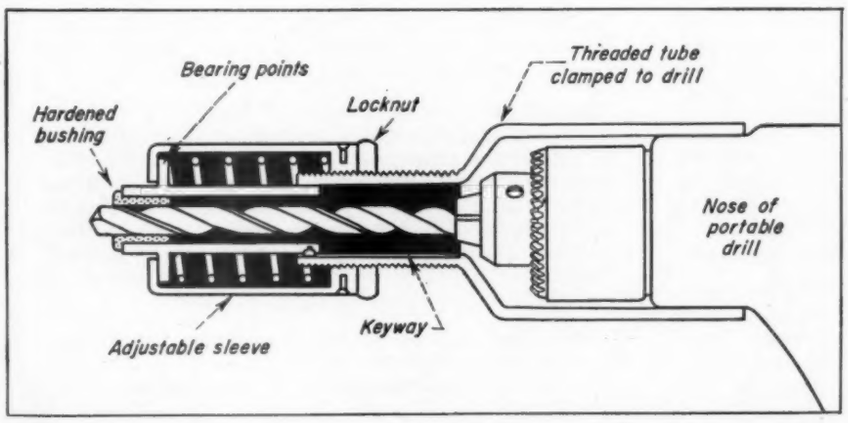
Replacing the toolrest on a bench grinder with this V-block fixture provides an easy way to remove lathe parts neatly

Portable Drill Adapter Reduces Breakage

EARL M. LEHIGH

Power drilling of small holes with a portable unit usually means a lot of broken drills. Here is an easy-to-make adapter, suitable for most electric drills, which will cut costs and lost time to a large extent. It is a semi-production device, and though universal, it is not intended for use when drill bits are changed frequently.

With the adapter, the drill is constantly supported at its outer end by a hardened bushing carried in a spring-loaded sliding tube which has the action of a piston and piston rod. Its outer end is flanged to fit the in-



Production portable drilling can be stepped up by minimizing breakage with this adapter

side of an adjustable sleeve which limits the extension of the bushing. The inner end of the tube slides inside the threaded tube which also holds the sleeve. Between the flange and the nut is a coil spring which keeps the bushing at its outer position and against the work during drilling. The threaded tube is bracketed to the nose of the drill, and a keyway inside prevents the bushing tube from turning.

The long thread provides plenty of adjustment to allow for the shortening of drills as they are ground down. If more clearance is required for drilling in confined places, the bushing-tube can be made with a longer neck at a slight sacrifice in rigidity.

Lathe Carriage Pointer Gages Bore Depth

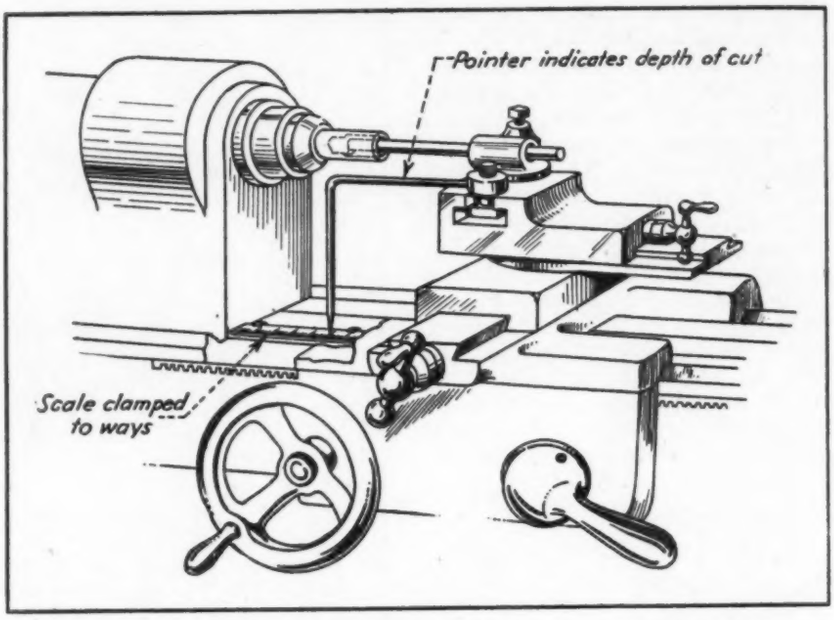
DONALD R. TRYER

When boring on a lathe to a shoulder using the longitudinal carriage feed it is necessary to stop the machine and use a scale to determine how far the work has progressed, and under some conditions, it will be necessary to back the boring bar entirely clear of the bore in order to measure the depth.

To overcome this, I made an adjustable pointer to fasten to the compound rest out of an ordinary ¾-in. T-bolt, with a 2-in. x ¾-in. thick washer and ¼-in. steel rod. The washer was drilled and tapped ¼—20. The steel rod was ground to a point at one end, bent 90° and threaded to fit the washer at the other end.

In use, the T-bolt is set in the slot of the lathe compound and the rod pointed down toward the inside of the bed. A steel scale is laid on the bed so the carriage will clear it, and held in place with a C-clamp.

When the piece to be bored has been faced, the pointed end on the T-bolt is set at the end of the scale and the nut tightened down. Then, as the cutting tool advances, the point of the rod will move along the scale and show the depth of the bore at all times.



With boring bar at the edge of the hole, the pointer and scale are set to zero. Depth readings are then continuously shown as the cut progresses

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Payment—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in a tie, duplicate payments will be made. Judges' decisions are final in each case.

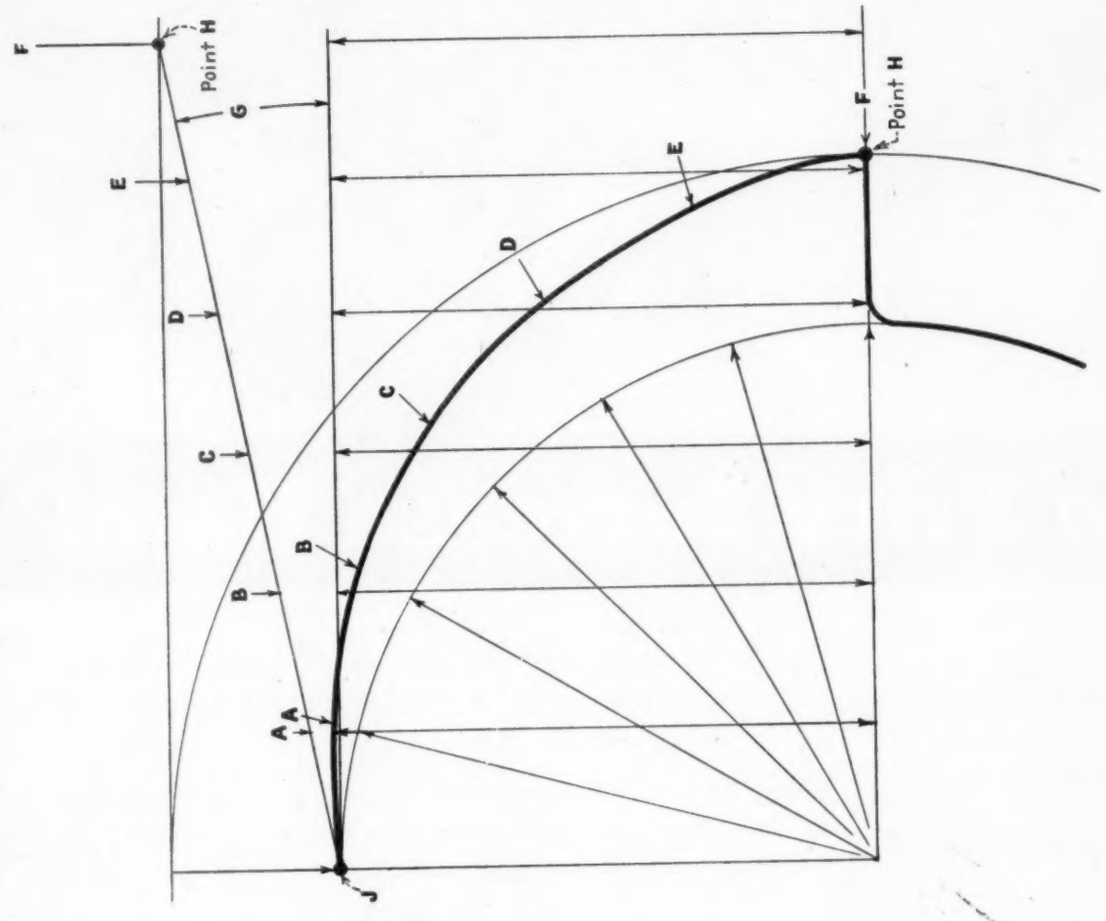
Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

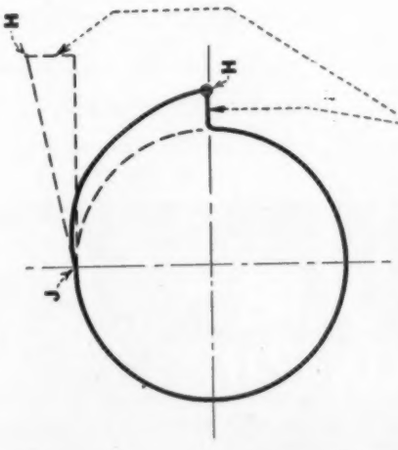
Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments.

First Selection: R. B. Taggart, on lapping fixtures for calipers

Layout of Cam Locks

BY NATHANIEL B. ARCHER





Working portion of cam resembles a wedge wrapped around cylinder

*To obtain secure locking action angle **G** (on developed diagram) should be not more than 9°*

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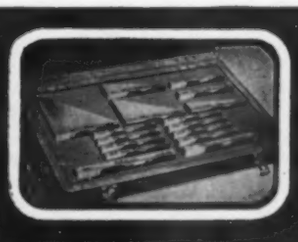

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Cutting-Fluids Selection Guide

THESE RECOMMENDATIONS WERE PREPARED BY THE HEADQUARTERS WAGE INCENTIVES DEPARTMENT, WESTINGHOUSE ELECTRIC CORPORATION

AMERICAN MACHINIST REFERENCE BOOK SHEET

CUTTING FLUIDS FOR MACHINE REAMING

MATERIAL	CUTTING FLUID
Aluminum & alloys Magnesium & alloys	Mineral Lard Oil Kerosene Soda Water
Brass and Bronze	Soda Water
Cast Iron	Dry
Cast Steel	Lard Oil Mineral Lard Oil Soda Water
Copper	Lard Oil Soda Water
Malleable Iron	Soda Water Mineral Lard Oil
Monel Metal	Lard Oil Soda Water
Mild Steel	Mineral Lard Oil Soda Water
Tough Alloy Steels Steel Forgings	Mineral Lard Oil Sulfurized Oil Soda Water
Steel, Tool	Lard Oil Sulfurized Oil Soda Water
Wrought Iron	Mineral Lard Oil Soda Water
Micarta & Bakelite	Mineral Lard Oil

CUTTING FLUIDS FOR DRILLING

MATERIAL	CUTTING FLUID	
	Order of Decreasing Effectiveness	Order of Increasing Expense
Aluminum & alloys	Kerosene Kerosene & Lard Oil Soda Water	Soda Water Kerosene Kerosene & Lard Oil
Brass	Dry Kerosene & Min. Lard Oil Soda Water } Deep Holes	Dry Soda Water Kerosene & Mineral Lard Oil
Magnesium & alloys Bronze	Mineral Lard Oil Soda Water Dry	Dry Soda Water Mineral Lard Oil
Copper	Mineral Lard Oil & Kerosene Soda Water Dry	Dry Soda Water Mineral Lard Oil & Kerosene
Monel metal Mild steels Tough alloy steels Steel forgings Cast steel Wrought iron	Mineral Lard Oil Sulfurized Oil Soda Water	Soda Water Mineral Lard Oil Sulfurized Oil
Manganese steel Cast iron	Dry	Dry
Malleable iron	Dry Soda Water (Deep Holes)	Dry Soda Water
Tool steel	Mineral Lard Oil & Kerosene Kerosene Mineral Lard Oil	Mineral Lard Oil Mineral Lard Oil & Kerosene Kerosene
Micarta, Bakelite fiber, asbestos hard rubber, ebony	Dry	Dry

CUTTING FLUIDS FOR TAPPING

MATERIAL	CUTTING COMPOUND
Aluminum alloys	½ Lard Oil & ½ Kerosene
Magnesium alloys	Light Mineral Oil
Brass and bronze	Light Mineral Oil Dry
Cast iron	Small Amounts of Min. Lard Oil, Soap, or Tallow
Copper	*"Cresol z-3" & Paraffin Oil #3313-4 & Paraffin Oil
Malleable iron	Sulfurized Oil
Monel metal	Lard Oil & Kerosene Sulfurized Oil
Wrought iron Mild steel	#3313-4 & Paraffin Oil
Tool steel	Sulfurized Oil Lard Oil & Kerosene
Stainless steel	Sulfurized Oil
Tough alloy steels Cast steel Steel forgings	Sulfurized Oil
Rubber, hard Fiber	Dry
Micarta, Moldarta & other molded plastics	Dry

*"Cresol z-3" is an excellent heat dissipator and does not stain the work. It is rather expensive but may be used in a 10% solution of Paraffin Oil. No. 3313-4 is also sulfurized oil.

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NEWS OF METALWORKING

War-trained Labor Unsatisfactory for West Coast Plants; Production Lags

SAN FRANCISCO — War-trained workers accustomed to single-operation machine work during the war are becoming a new type of war casualty in this area. Today, these workers, although classified as journeymen, are lacking in the skill required for general machine shop work, and production is suffering from idle tools as a result.

Shop owners are beginning to feel that the type of worker they need has never been in the area. Backlogs would assure production levels far above prewar operating rates, but adequately skilled labor is lacking. Efforts at recruiting and importing skilled workers from Eastern and Midwestern areas has met with little success.

Newcomers, GI's May Help

Some temporary relief is found in working setup men, journeymen machinists, etc., many hours overtime, but employers feel that the permanent solution to the dilemma lies in the apprentice and the apprentice helper. Efforts are being made to attract ex-servicemen into the crafts, and with the postwar influx to California from other states of about 200,000 such workers, such developments may provide the answer. Subsistence allowance paid by the Veteran's Administration for on-the-job training is encouraging ex-GI's to work as apprentices.

But the labor shortage may get worse, once that the national labor and price situations settle into some workable pattern. If adequate materials (now tied up by strikes) and satisfactory prices are granted by OPA, production levels far above present rates would be justified. But at that point, the shortage of skilled labor would pinch even further. As it is, many plants are just recovering from the 150-day machinist strike.

OPA Relief Helpful

Many shop owners are encouraged by indications that OPA is loosening up, which affects future operations in two ways: (1) it indicates that they will better prices for their own products; and (2) they feel that scarce parts, equipment and materials will be released westward, when eastern manufacturers get higher profits.

They have high hopes that surplus machinery will be made more easily available soon. They also hope that their expansion plans will not be set back by the new housing program. But their greatest hope is that they will have enough trained personnel once they are ready for full production.

MAGNESIUM CONSUMPTION RECOVERING FROM LOW

WASHINGTON—Steady rise in the application of magnesium to consumer goods will absorb around 75,000,000 pounds this year, reaching an estimated total of 150,000,000 to 200,000,000 pounds by the end of next year.

Production is at zero right now. Dow Chemical Company, apparently the only manufacturer still in business, is noncommittal on reports that its Texas plant will soon resume operations. Company's plans are contingent on policy in disposal of government surplus stocks. Dow, and other companies which produced during the war, still have supplies on hand.

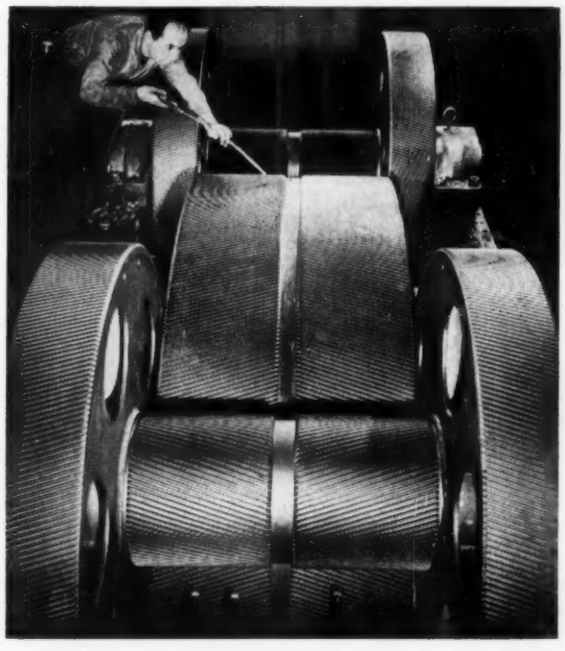
Markets Improving

Spokesmen for Dow are enthusiastic on the market prospects for magnesium typewriter frames, lawn mowers, bicycles, window storm sashes, baby strollers, baseball masks, griddles, row boats, and many other projects. All of these applications are in actual development or production stage.

Magnesium is produced in extrusions, sheet, castings, and forgings. Castings, of course, are brittle. The alloy is about ten percent of aluminum and zinc combined. Heat conductivity is almost as high as that of aluminum.

Electrical Truck Survey

CHICAGO—34,802 electric industrial trucks for material handling are used in 5,000 plants, according to a survey by the Electric Industrial Truck Association. Of this total, 4,582 electric trucks are being used by 591 machinery manufacturing plants. The steel industry leads the list with 6,049 trucks in 965 plants. The transportation industry ranks second.



Turbine Bull Gear — This bull gear is being slushed at the South Philadelphia Works of Westinghouse Electric, prior to shipment. Fabricated of forged carbon steel rims connected to the hub by one-piece plate centers, the gears are hobbed in air-conditioned rooms to minimize expansion and contraction by minor temperature changes. The unit is used in Victory ships to transit power from the 6000 hp. turbine to the propeller

Gaging Business

OPA, Labor Vs. Industry

Labor and the OPA continue to hamstring industry's efforts to get along with maximum peacetime production. Despite frequent statements by government officials concerning how well along reconversion is, the fact remains that some 10,000,000 tons of steel production have been lost thus far this year with more losses to come, about a billion-dollar loss has been suffered by the auto industry, millions of dollars worth of production has not been turned out in the farm equipment and electrical equipment industries, and untold millions of dollars worth of finished items and parts have not been, and will not be, made due to OPA price ceilings.

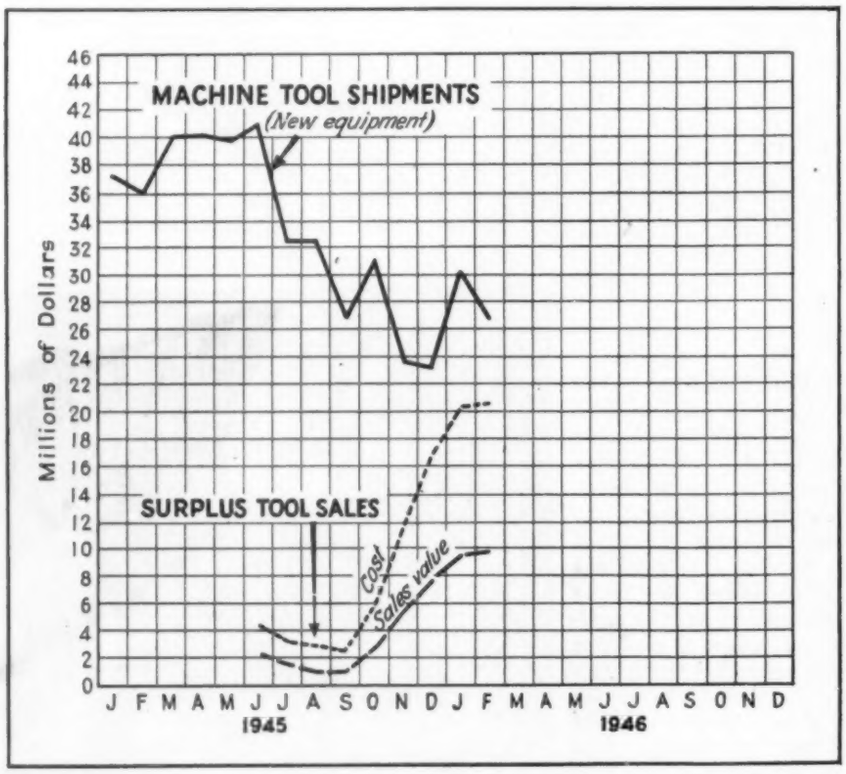
These staggering losses have been brushed aside by reference to the pessimistic and erroneous predictions made by government experts eight months ago on the amount of time that industry would need to reconvert. This accounts for the little government concern over the current coal strike and the 400,000 tons of steel that have been lost.

Price 'Bulge' Grows

The recent OPA price increases, originally dubbed by that agency as a "bulge" in the price line is fast becoming a mountain. The steel price increases forced higher prices for manufactured products using steel. The coal strike will mean higher coal prices, and may hasten new requests for price relief by the steel industry. Perhaps more far-reaching will be the impending increase in freight rates, which will unsettle price ceiling all over again. Higher freight rates will raise costs for users of raw materials, and where manufacturers absorb some freight rates it will discourage their shipments to certain areas. This is already happening in the steel industry.

Over all, the volume of requests for price relief are apt to increase over coming months. It will be difficult for OPA to justify opposition to some increases, after granting relief in parallel cases, but delay in granting them will hamper production.

Looking behind OWMR's estimate of a 1946 national product of $154 billions, the figure becomes $122 billions after adjusting it to 1941 price levels. Since the figure includes personal and commercial services, farm production and fishery output, these factors probably offset some of the disruption to industrial production caused by strikes and OPA-caused dislocations. They largely account for fact that the adjusted $122 billions is above 1941's total product of $107 billions.



Crucial Period Looms Ahead For Tool Sales—Surplus machine tool sales have been making steady gains, partly at the expense of new equipment shipments. This factor was one reason given by OPA in suspending ceilings on some capital equipment, and allowing 20% price increases on others. It remains to be seen whether higher prices for new tools will boost sales of surplus equipment

Tool Relief Disappoints

OPA's lifting of price ceilings on a few large machine tools, and limiting price increases of the more popular small types to 20% received a cold reception in the industry. Major reason was that the items on which ceilings had been lifted involved a small portion of probable total sales of the industry. Moreover, the 20% price increase was given at the same time that higher prices were granted on many parts that go into the machines. This saddles tool builders with newly increased costs, simultaneously with relief intended to ease prior cost increases.

While machine tool business has been holding up rather well, and cancellations have been low, it is expected that higher prices for new machine tools will aid surplus equipment sales. The price increase comes at a time when surplus declarations have hit a peak, and the sales machinery for the War Assets Administration has been greatly improved.

Other Production Troubles

One bright spot in OPA's action is that castings producers will now be able to increase output, and add overtime workers. This will ease this critical bottleneck for machine tool and other equipment builders.

But it was a general disappointment that nothing was done on prices for motors, now the major bottleneck in the equipment industry. Both General Electric and Westinghouse were jammed with orders before strikes hit both companies, with backlogs on some types stretching out over a year. The strikes in both companies, still continuing in Westinghouse, have lost millions of dollars worth of production of motors. Only means of ever catching up on the motor backlog would overtime and extra shifts, but prices will not permit this at present. It is possible that OPA has been holding up such price action until the Westinghouse strike is settled.

To top off these difficulties, many builders have been hit by a drop in labor productivity, which they cannot explain. This, coupled with material shortages, leaves tool production badly disrupted. One manufacturer reports he is losing one month's output every 90 days.

Coal Strike Impact on Steel Output Begins; Freight Boost New Handicap

PITTSBURGH—With a record peacetime backlog which they have been unable to reduce, steel managements are becoming embittered at more recent developments, including the steel strike, higher material costs, and now a prospective freight rate increase.

First quarter financial results from steel production showed large losses, and hopes that the coal strike would prove to be of short duration (to permit some profits in the second quarters) are being dissipated. Even though steel production after April 1 went down slowly incidental to the coal strike, it is known that the period of recovery takes time, and the coal suspension has lasted long enough to bring the realization that the loss in steel ingots will run into millions of tons.

10 Million Tons Lost

First quarter steel production was down 10,000,000 tons from the same period of 1945 and the enormity of this loss is only just beginning to be realized in consumer circles where stocks of steel are so small that vacations in production have to be taken periodically.

Likewise, this recognition has begun to percolate Washington officialdom where the needs of steel push efforts to end the coal strike. The "captive mines" will meet the terms of any agreement with the commercial coal operators on a retroactive basis, even though these mines do not sell coal in the open market, they are not permitted to operate.

Coal Strike Felt

Ingot production in the Pittsburgh district dropped to 87% in the first week of the coal strike from 100% in late March, and in the second week to 70%. The latter half of April will see this decline accelerated, but local production will be at least 25% or better even if the coal strike lasts two months. Some plants have substantial coal supplies, even though others do not. Despite the shortage of scrap, there has been increased charging of cold materials in steel furnaces to save coal.

Dwindling production has again disrupted mill schedules and increased pressure by consumers to obtain steel. Under the circumstances, it is almost futile for consumers to try to enter new business or mill books. The emergency housing order restricting industrial construction has had no effect upon existing steel business, which indicates expectation of changes in construction regulations, or specific project exemptions. Since such exemptions may not be widespread, it is possible that cancellations of orders for heavy shapes may develop later in the year.

Freight Rate Headache

The expected freight rate increase will affect costs of incoming materials to the steel mills more than the realized price of steel. Most freight absorption on finished steel products has been eliminated in recent months as mills have tended to restrict selling to more neighboring territories. This is a trend which has not been desired, but was forced by price conditions. Companies with a minimum of plant decentralization realize that they may have to pay a heavy cost for this trend with the return of normal marketing conditions.

Senate Finally Reports Mild Labor Bill; Minority Seeks Amendments

WASHINGTON—Proponents of strike control legislation passed their biggest hurdle when the Senate Education and Labor Committee reported a bill to the Senate floor, even though it lacked teeth and bore no resemblance to the stringent Case bill.

The big job always has been to get any kind of labor control bill through the committee, which has usually pigeon-holed or disapproved such legislation.

With the matter before the full Senate, advocates of a stronger law than that proposed by the committee have an opportunity to push amendments which would fulfill their objective. What kind of law we wind up with—if any—will depend on what compromises are made in joint conference between the milder Senate version and the tough Case bill which the House passed so overwhelmingly, 258-155, in February. Then, too, there remains the possibility of a presidential veto and the question whether Congress would override a veto with elections coming up.

Senate Bill Mild

The measure reported by the Senate committee is a complete substitute for the Case bill, although it carries the same number: H. R. 4908.

The Senate committee version provides little more than is already available to labor disputants. It sets up a five-man Federal Mediation Board, with no compulsory powers, within the Labor Department. This board would merely offer mediation and conciliation services and urge voluntary arbitration. If disputes are not settled by this means, a report would be made to Schwellenbach.

A Republican minority of the committee, led by Senators Ball and Taft, feels that the proposed law fails to meet two requirements which are considered necessary in the labor relations field: (1) To strengthen mediation machinery and require both sides to withhold strike or lockout action until the machinery has functioned, and (2) to impose on unions legal responsibilities and duties commensurate with their vast power.

Fight For Amendments

To correct this deficiency, these senators feel that the bill should be amended to:

1. Provide a 60-day cooling off period from the date negotiations are requested. Agreements should provide for final and binding settlement of grievances. Violating employers would be guilty of an unfair labor practice. Striking employees would lose legal right to reinstatement.

2. Provide for fact-finding boards in serious disputes affecting public utilities, with an additional 35-day period barring lockouts or strikes.

3. Make unions suable in federal court for violation of contract.

4. Make secondary boycotts by unions in restraint of commerce unlawful and subject to prosecution under antitrust laws.

5. Amend the Wagner Act so that employers would not be compelled to deal with unions of foremen, as is now required by recent 2-to-1 decisions of the National Labor Relations Board.

6. Make use of violence or intimidation on the picket line, as well as use of labor spies and strikebreakers, subject to federal court injunction.

Rail Equipment Makers Hard Pressed to Meet Domestic Needs

CHICAGO — Railroad equipment makers expect domestic railroads to absorb the bulk of their output over the next several years, with little left over for the export market. This situation is expected to intensify foreign demand for used rolling stock. In either event, indications point to heavy equipment demands by domestic and foreign railroads as they strive to bring their operations back to normal and improve their service. American railroads are in a strong financial position to replace much of their old equipment.

Mexico, China and South American nations are expected to absorb huge quantities of older American equipment when it is free to be sold, since those nations have a large mileage of U.S. standard track. Europe does not present as attractive a market for used American rolling stock, since track gauges vary, bridge clearances are often inadequate, and braking equipment differs. Remodeling old equipment to meet these differences would be too expensive to be practical.

New Passenger Cars

American Car & Foundry has announced new orders for 110 freight cars, divided among three railroads, and has just received a $1,500,000 order for 16 lightweight streamlined passenger cars from Chicago & Northwestern. ACF has close to $5,000,000 worth of passenger car orders. Pullman-Standard is getting ready to shift into high production as labor and material difficulties iron out. It is working on 12 streamlined sleeping cars for Chicago & Northwestern and 20 streamlined coaches.

Budd Manufacturing, which plans to merge with Budd Wheel, has orders for more than $50,000,000 worth of rail equipment on hand, including some revolutionary coaches for the Chesapeake & Ohio. Some of these new type cars will be put in service soon.

Locomotive Boom

Locomotive producers also expect a boom in business for some time ahead. Fairbanks-Morse hopes to have its strikebound plants in operation soon. Electro-Motive Division of General Motors is getting back into production. American Locomotive has back orders approaching $100,000,000. Other rail equipment makers in this area are also optimistic. Poor & Co., which had little trouble reconverting, reported for 1945 the second highest sales in the company's history.

Bliss Moves to Detroit

BROOKLYN, N. Y.—The E. W. Bliss Co., producers of stamping presses, rolling mills and can-making machinery, has transferred its executive offices from Brooklyn to Detroit, according to D. S. Harder, president. The company explained that it was logical to center its sales and manufacturing program from Detroit, which it considers the "hub of the wheel for capital equipment."

D. S. Harder

The move is one phase of an extensive expansion program now underway, involving $2,000,000 in equipment and building expenditures. Location of the new office will be at 450 Amsterdam Street, Detroit, Mich. The company will continue its manufacturing activities in Brooklyn, as well as its plants in Toledo, Cleveland, Salem, O., Hastings, Mich.; Derby, England; and Paris, France.

Nonferrous Ceilings Held

WASHINGTON — OPA has granted subsidy payments to meet the cost increases resulting from wage adjustments in non-ferrous metal mining, smelting and refining. As a result, ceiling prices for copper, lead and zinc will not be increased.

About 1,000,000 pounds of lead will be recovered by the War Assets Administration from surplus combat aircraft. The lead is in control surface counterweights on the planes and some types yield over 100 pounds. All lead recovered is turned over to the Metals Division of War Assets where it is sold on an allocation basis.

Non-destructive Testing, Special Metals Highlight Instrument Meeting

DETROIT — Non-destructive testing by means of supersonics was a subject of interest at the spring meeting of the Instrument Society of America, held at the Horace H. Rackham Memorial Building here. Harry Shaper, Brush Development Co., delivered a paper on this testing method now being used by plastics, rubber, and steel makers.

In his talk, illustrated with photographs, Mr. Shaper showed how supersonic testing is done by projecting a 500-kilocycle sound wave through the piece tested and recording the pick-up with a microphone.

Detecting Laminations

Plastic sheets of lucite, which did not show laminations to the X-ray and were barely discernible to the eye, were indicated as to area and amount by the correlation of the curves obtained with the sound apparatus. Sheet steel is one of the most important applications, and Republic Steel is now trying it out. Any defects in the steel sheet are immediately shown on the graphs made by the instrument recorder. These tests are run under water as the sheets pass through the pickling process.

He explained the construction and operation of the device, which consists of four fundamental units—electrical power source to vibrate the ammonium phosphate crystal that is used to obtain supersonic monodirectional waves; the transducer which carries the crystal, a microphone receiver and suitable amplifying apparatus to operate the graphic recorder.

Selecting Proper Metals

Robert W. Carson, Instrument Specialties Co., discussed "How Special Metals Solved Instrument Problems." He touched on little-known characteristics of well-known metals and alloys, and illustrated their application. He reviewed changes of magnetism with temperature, the elasticity of springs, instrument sensitivity, control and fabricating problems.

Special alloy springs, for example, today permit the measuring of variations in gravity. In considering magnets, silicon steels magnetize quickly but lack permanence, chrome and tungsten steels make fine permanent magnets.

Among the other papers presented at the April 4th meeting were: "Diaphragm Control Valves" by Bruce Irwin, Hammel-Dahl Co.; and "Piston Ring Gaging Instruments" by Paul Exline, Gulf Research & Development Co.

Detroit Letter

Long-range Confidence High

No matter how dark the present production outlook may be, the automotive industry is looking far ahead and eyeing new goals. It is gambling with plenty of blue chips that by next year the path will be clear of most of the obstacles which now block it from the juicy markets.

The Ford Motor Car Co., resuming after almost a week of idleness at Rouge and 12 branch plants because of the steel situation, is moving its truck and bus assembly lines from the Dearborn plants to its Highland Park plant. It will spend $2,000,000 on this move and is expected to double production of Ford, Mercurys, station wagons and trucks. The move is expected to be completed by mid-October and will add 2,500 to the 10,500 now employed in Highland Park.

Chevrolet Expansion

Chevrolet, not to be outdone, finally revealed some of its plans for its new light car division. It has applied for authority to start building not one but two different plants, adjacent to each other. One will be at Parma, the other Brook Park, both suburbs of Cleveland.

The division will spend about $50,000,000 on its venture into the light car field. It tried this once before on a lesser scale and went back to its regular models.

Now a separate and almost independent division is being set up. Arnold Lenz will be in charge but M. E. Coyle, the general manager of Chevrolet, will still be top man. Marketing will be through the same sales organization which Chevrolet has built up but manufacturing will be independent.

Earle S. MacPherson will be chief engineer. He and a large staff have been hard at work for many months setting down specifications for the new job. They have them ready to put into wood and steel. Although no details have been revealed by Chevrolet, it has leaked out that it will be a six cylinder job. At one time it was rumored it would be a rear-engine car but this idea has since been abandoned. Top GM officials see no advantage to a rear-engine job. The car will sell under $1,000.

May Build Own Bodies

As reported here several months ago, one of the startling innovations the new division will test out is whether it can build bodies cheaper than it can buy them from Fisher Body, regular supplier for all GM divisions. M. E. Coyle's disclosure of construction program in the Ohio villages showed that among the buildings in the Parma layout will be a body shop.

The Parma plant will have 1,500,000 square feet of floor space. It will include pressed metal, body and final assembly operations. The Brook Park plant will make axles, motors, transmissions and other component parts. It will have 1,000,000 square feet of floor space. Each will employ about 5,000.

Output Rising

The main Chevrolet division expects to make 145,000 passenger cars in the second quarter, according to Coyle. Its schedules call for 20,000 in April, 50,000 in May and 75,000 in June. Coyle tempered his predictions with the warning that either manpower or materials or both may upset his schedules.

But looking ahead, the Chevrolet chief saw the time not too far off when the division would be going at the rate of 6,750 cars a day and 2,750 trucks. The best pre-war production of the division was a total of 6,240 units in one day.

Building up to this tremendous figure may take several years, Coyle admitted. The expansion program, of which the light car division is part, may take several years.

More Pontiacs, Too

Pontiac division of General Motors has similar plans. Harry J. Klingler, head of Pontiac, envisions the time when his plant will turn out cars at the rate of one a minute. He aims at a volume of 500,000 a year.

This scheduling would place it ahead of Buick. Right now Pontiac is turning out 300 sixes and eights a day. The output is being stepped up gradually. The 500,000-a-year rate will not be reached for another year, according to Klingler, even under the most auspicious circumstances, which do not appear too likely right now.

Strike Interruptions Cited

The Chrysler divisions are still maintaining a steady pace. A recent strike at the Briggs body plant slowed several down for a few days. DeSoto was stopped and so was Plymouth. But they got under way and are heading upward.

Hudson was forced down by a suppliers' strike in Cleveland and Packard is still waiting for GM parts to start it. Some of the machining sections are open and the assemblers will be called back before the end of the month.

But the industry is keeping a watchful eye on the coal strike and the closing down of steel mills. Steel is tighter than ever and promises to be a big bottleneck, even if the coal strike ends quickly. Only GM seems favored at the present time with its pre-strike inventory of 45 days. But eventually, this corporation will feel the effects too.

New Plymouth and New Sedan—The new Plymouth 5-passenger Club Coupe (at left) features 34 mechanical improvements and 16 appearance betterments, including the new Chrysler hydraulic brakes. Other improvements include new propeller shaft and universal joints with needle bearings. The Dodge 4-door sedan (at right) features massive stainless steel grille, widely-spaced headlamps, and new front and rear brakes with two brake pistons per wheel

Machine Tool and Equipment Prices Lifted 20%, Some Items Decontrolled

WASHINGTON — Under opposite pressures from all directions, OPA in its "most extensive" de-control action thus far, suspended price control on a wide list of heavy machinery and equipment, including heavy machine tools, and ordered a cross-the-board 20% price increase for machine tool manufacturers.

OPA's order is a retreat, but only to a new position. The action is "experimental"; controls are suspended, not removed. Price movements and any diversion of manpower will be carefully watched, says Administrator Paul A. Porter, and control will be restored promptly on any item at any time it is deemed necessary to curtail inflation.

Labor and consumer advisory committees in OPA strongly opposed the wide bend in the price line, affecting six major categories in capital and producers' goods.

More Decontrol Asked

From the opposite direction came strong demands of machinery and machine tools groups for still more, and eventually complete, price decontrol. These groups contended that price increases on heavy equipment, since purchases are amortized over a long period, would not contribute to inflation. Their argument was effectively presented at Congressional hearings on a bill to extend the life of OPA for another year. Thus the price agency was faced with the alternatives of giving ground or of being weakened or killed. Its present liberalization of policy was partly forced by threat, and the threat of specific price legislation, especially on machinery and machine tools, is still much alive on Capitol Hill.

The fact is barely mentioned in Mr. Porter's statement, but OPA in decontrolling prices on heavy machine tools is relying extensively on War Assets Administration's large supply of heavy machine tools to hold prices down. From that point of view, OPA'S decontrol concession is not as generous as it appears.

Surplus Sales High

Surplus machine tools are now selling at the rate of about $30,000,000 per month, with the invoice at about a half billion dollars. The rate of disposal will rise so that most salable tools will be sold by the year end. Surplus selling exceeds sale of new machines, which is now at the rate of about $21,000,000 per month, with an eight-month backlog of orders. Production of new tools is seriously hampered by a severe shortage of electric motors, and efforts are under way to locate suitable motors on unsalable tools and on other laid-up government equipment.

Order Disappointing

OPA's specific order on the 20% machine tool price increase was expected within three to five days after the equipment de-control order. Industry spokesmen, displeased that the de-control order did not include medium and small machines which are in demand, feared that the 20% increase action would exclude a large field of small equipment, such as hand tools, which are usually purchased under the head of "expenses" which OPA might regard as contributory to inflation.

Notable recognition by the Government of the machine tool industry's position is seen in Mr. Porter's statement that the annual production rate of $1,500,000,000, which kept costs at a minimum, has dropped to about $360,000,000.

Suspended price controls are experimental, and are for an "indefinite period" and may be lifted and price control restored at any time, in which case a new ceiling, the same, higher, or lower, than the ceiling at the time of suspension, may be established. Analysis of OES directives by Machinery and Allied Products Institute indicates that while exemption from price control seems to be contemplated after probationary suspension, there is no assurance that any particular item will be exempted, even though the price has shown no unwarranted increase.

Wages and Prices

Controls on wage increases, when used as a basis for price relief, still apply to production of goods under the price suspension order. Any unapproved wage increase during the suspension period will be disregarded in setting new price ceilings following the lifting of any suspension. Establishment of any new wage and salary rates in connection with new plants or departments thereof, still must be approved by the Government's stabilization agencies.

It is known that OPA is considering price decontrol for still other categories of machinery and equipment, and that individual relief actions will continue, probably on a more generous basis than in the past.

The six categories of equipment decontrolled are: Electrical producers' goods, machine tools, processing machinery, construction equipment, transportation equipment, and miscellaneous—such as dies, jigs, fixtures, some molds and patterns, some forgings, low-speed diesel engines, steam generating equipment, etc.

MAJOR ITEMS OF MACHINERY AND EQUIPMENT FOR WHICH PRICE CONTROL HAS BEEN SUSPENDED

1. Electrical equipment as follows:

Magnets, lifting, industrial
Switch gear as listed in the N.E.M.A. Manual, Part IV, dated January 31, 1946, in sub-section of Section 8 SG as follows:
8-SG-3 Large air circuit breaker group
8-SG-4 Power oil circuit breaker group, except outdoor power circuit breakers 15 K and below.
8-SG-5 Power switchboard group
8-SG-5a Manual and Automatic switchgear assemblies
8-SG-5b Metal enclosed switchgear
8-SG-5c Relays, regulators and miscellaneous switchboard devices sold separately
8-SG-6 Power switching equipment group, except that for 15,000 volts and less
Welding equipment, direct arc welding types only
Welding equipment alternating current, including fusion type welding, rotating arc welding units, but not including transformer type welders
Welding rods and coated electrodes

2. Machine tools as follows:

The following new or second hand machine tools covered by MPR'S 67 and 1:
Automatic screw machine, single and multiple spindle, over 2½" spindle capacity
Bending rolls, all sizes and types, over 50,000 pounds in weight
Board hammers, all sizes
Boring mills, horizontal, over 5" boring bar
Boring mills, vertical, over 62" swing
Car wheel lathes, all sizes
Cylindrical grinders, plain and universal, over 20,000 pounds in weight
Engine and turret lathes, over 24" swing
Face and surface grinders, vertical and horizontal, all types over 15,000 pounds in weight
Forging presses, all sizes and types
Hydraulic presses, all sizes and types over 50,000 pounds in weight
Mechanical presses, all types and sizes over 50,000 pounds in weight
Milling machines, horizontal and vertical, over size #3
Milling machines, other types, over 15,000 pounds in weight
Planers, single and double housing, over 48" x 48" x 10"

MAJOR ITEMS OF MACHINERY AND EQUIPMENT FOR WHICH PRICE CONTROL HAS BEEN SUSPENDED

Radial drills, over 5' arm
Screw machines and turret lathes, over 2½" spindle capacity
Squaring shears, over 30,000 pounds in weight
Steam hammers, both single and double frame
New and second hand attachments as defined in MPR's 67 and 1 designed specially for a machine tool listed in this paragraph and produced by the machine tool manufacturer and sold by the machine tool manufacturer or by his dealer.

3. Miscellaneous equipment as follows:
Chain hoists (manually operated)
Clamps
Cranes, bridge, gantry, hammerhead, jib
Dies, jigs, fixtures, mold and patterns, except sales by manufacturers of products in whose production such dies, jigs, fixtures, molds or patterns are used.
Filters, filter elements and parts, industrial, subject to Revised Maximum Price Regulation 136
Forgings, open or flat die, not including commercial drop forgings
Hose and tubing, flexible, metallic, except electrical metallic tubing
Instruments, mechanical for indicating, measuring, testing and/or recording, (all types covered by Revised Maximum Price Regulation 136)
Industrial machinery covered by Revised Maximum Price Regulations 136 which is used in the extraction, production or processing of commodities and is not included in any of the categories of products specifically listed in Appendix A of Revised Maximum Price Regulation 136
Liquid controlling and/or regulating devices, manually operated, designed and sold for use with machinery and equipment covered by Revised Maximum Price Regulation 136, but excluding standard general purpose valves and devices
Shims, metallic, when fabricated as machine parts
Springs, mechanical precision
Steam cleaning and degreasing equipment and parts-washing and cleaning equipment, industrial, except commercial and domestic dish and utensil washing and cleaning equipment
Tools, hand operated, especially designed for the manufacture, repairs, or maintenance of aircraft, military or naval vehicles and equipment
Welding and cutting equipment, gas, limited to torches, tips, regulators and generators

4. Transportation equipment as follows:
Railroad and transportation equipment covered by Revised Maximum Price Regulation 136, specifically including, but not limited to:—
Cars, freight, including all types of flanged wheel mining and industrial cars.
Cars, passenger, for surface, subway or elevated lines.
Locomotives and tenders, including mining and industrial.
Machines, tools, devices, appliances, designed especially for the installation, operation, maintenance and protection of tracks, yards, signals, rolling stock and motive power of surface, subway or elevated rail lines, including frogs, switches and special track work.
Railroad car and locomotive parts and specialties for elevated, subway and surface lines, including: Axles; bearings, truck side; boilers, fireboxes, front ends and cabs, fitting, fixtures, devices or appliances mounted thereon.
Trucks, industrial, hand, not including lift trucks and portable elevators as well as special purpose commercial trucks covered by maximum price Regulation 188.

5. Processing machinery as follows:
Foundry machinery and equipment as follows:
Blast cleaning equipment (sand or shot); Core making and core crushing machinery; Cupolas; Dust collecting equipment; Furnaces, electric metal melting; Flasks, ladles, not over 40 tons capacity; metal molding machines; Sand preparing equipment; Shakeout equipment; Tumbling barrels or tumbling mills
Textile machinery—
Fiber to fabric machinery as follows:
Cleaning and opening machinery (for cotton, wool or other fibers); Carding machinery; Combing machinery; Drawing and roving frames; spinning and twisting machines: yarn preparatory machinery; Synthetic fiber spinning machinery; Machinery for filament extrusion; Staple fiber spinning machinery
Fabric machinery as follows:
Looms; Knitting machinery; Braiding machinery; Lace machinery; Embroidering machinery
Bleaching, dyeing and finishing machines as follows:
Bleaching machinery; Dyeing machinery; Cloth printing machinery; Starching machinery; Dry-finishing machinery; Wet finishing machinery; Cloth handling machinery

6. The following parts, attachments accessories:
Attachments and accessories exclusively designed for incorporation in or attachment to and applicable solely to a particular machine or piece of equipment specifically suspended in this section 12. *This suspension does not apply, however, to sales of any of the following products except in so far as they have been specifically listed in other paragraphs of this section:*
Adapters; arbors, Blocks, machine tool; Brakes, spindle; Centers, bench; Centers, lathe; Chucks, all types; Die heads; Die sets; Dogs, work driving; Edges, straight; Electric etchers and de-magnetizers; Feeding devices; Glass, level; Guides, adjustable; Heads, universal dividing; Holders, tool; Holders, work; Mandrels, all types; Plates, angle; Plates, brick liner; Plates, face; Plates, lapping; Plates, surface; Plates, wearing; Posts, tool; Saw accessories; Sockets; stops, machine; Torque wrenches; Wheels, buffing and polishing; Wheels, abrasive; Batteries, storage, wet cell; Bearings, anti-friction; Bearings and bushings, ferrous and non-ferrous, subject to RMPR 136; Belting, leather and textile, subject to RMPR 136; Bushings, porcelain, glass and steatite for electrical uses; Cable, wire, and wire and cable accessories subject to MPR 82; Capacitors, electrical; Chain, chain fittings and assemblies subject to RMPR 136; Chains, power transmission, including sprockets; Circuit breakers, electrical; Compressors, air and gas; Conduit fittings; Conduit, metallic, for electrical use; Control equipment, electrical; Cutting tools, subject to RMPR 136; Cylinders, power, hydraulic, pneumatic and hydropneumatic; Distribution boards, electrical; Ducts for electrical uses, subject to RMPR 136, Electronic devices, equipment and parts, subject to RMPR 136; Engines, internal combustion, subject to RMPR 136; Engine generator sets, subject to RMPR 136; Fans and blowers, industrial subject to RMPR 136; Forgings, subject to MPR 351; Fuses for the protection of electrical equipment, subject to RMPR 136; Gears, pinions, sprockets and speed reducers, subject to RMPR 136; Generators, electrical, subject to RMPR 136; Glass products, industrial and scientific, subject to RMPR 136; Heat exchanger equipment, subject to RMPR 136; Heating units and devices, electrical, subject to RMPR 136; Hoists; Insulators, porcelain, glass, steatite, for electrical uses; Lighting equipment, electrical, subject to RMPR 136; Lubricating systems and devices, subject to RMPR 136; Magnetos, subject to RMPR 136; Motors, electrical, subject to RMPR 136; Panel boards, electrical; Plastic products, subject to MPR 523; Power transmission equipment subject to RMPR 136; Pumps, hand operated and power operated, subject to RMPR 136; Rectifiers, power industrial, Screw machine products, subject to RMPR 136; Signalling apparatus, subject to RMPR 136; Sound recording and reproducing equipment, subject to RMPR 136; Spraying devices, industrial, power operated, subject to RMPR 136; Springs, subject to RMPR 136; Sprockets, power transmission, subject to RMPR 136; Stampings, metal, subject to RMPR 136; Switch boxes, electrical; Switches, electrical; Switches, electrical, knife and enclosed; Switchgear and switchgear accessories; Tanks and vessels, new pressure, non-pressure and open, subject to RMPR 136; Transformers, electrical, subject to RMPR 136; Wheels, subject to RMPR 136; Wiring devices, electrical.
Parts of any machinery or equipment covered by RMPR 136 when the machine was produced prior to December 31, 1940, when such parts are not interchangeable with parts for machines being produced at the time of sale.
Parts, repair and replacement, which are designed especially for incorporation in any of the machinery or equipment listed in this section and which have been supplied by the manufacturer of the machinery and equipment. This includes, however, sales by resellers of such parts.

7. The following services:
Services in connection with the installation of any of the machinery or equipment listed in this section only when the machinery or equipment is sold by the manufacturer on an installed basis.

Westinghouse Machine Tool Forum Discusses Future Engineering, Outlook

PITTSBURGH — Electrical problems in connection with machine tool operation, the outlook in the machine tool industry and future requirements for machine tools were some of the topics dealt with at the tenth annual Machine Tool Electrification Forum held by the Westinghouse Electric Corp. at the Hotel William Penn in Pittsburgh April 9-10. Highlight of the sessions, attended by almost 300 machine toolmen, was the annual banquet at which Robert M. Gaylord, president, Ingersoll Milling Machine Co. and past president of the National Association of Manufacturers, was the principal speaker. At the luncheon on the second day William P. Kirk, president, National Machine Tool Builders' Association, Gwilym A. Price, president, Westinghouse company, and A. H. Phelps, Westinghouse vice president in charge of purchases, were the speakers.

Machine tool companies need the services of skilled imaginative engineers to design more efficient, highly specialized machines for the mass production factories, declared J. R. Weaver, manager, East Springfield Works, Electric Appliance Division, Westinghouse company, in discussing "A User's Future Requirements for Machine Tools." He said that to build the products for tomorrow which are now being designed, "we will need a new type of machine as much better than today's highly efficient models as the electric light is better than the old-fashioned tallow candle."

Multiple Machines

Mr. Weaver believes that "we must aim toward eventually performing all the operations on a piece with one machine. A machine to do this will combine many dissimilar operations and probably be relatively smaller in size and yet be sufficiently flexible to take care of periodic changes in design of product. When necessary to change the hold of a piece to complete the operation, positive and automatic transfer means must be devised." He outlined nine future requirements in machine tools: 1) Machines should be made as compact as possible; 2) they should be capable of being operated with the least amount of skill; 3) maintenance should be as simple as possible; 4) motors or control applications should be further developed to reduce hand operations; 5) machines should be able to make parts to even closer tolerances than is the rule today; 6) sturdier construction may be necessary to withstand greater forces for faster removal of material; 7) features should be developed to pre-set cutting tools to give finished tolerances on a piece without so much "cut and try"; 8) construction materials must be used with near-zero temperature coefficients of expansion; and 9) special-purpose tools must be developed in place of multi-purpose tools by elimination of adaptations not necessary for the specific job.

Finney Forecasts Outlook

The machine tool industry will do at least $250,000,000 of business in 1946 and $200,000,000 in 1947, as compared with a prewar average of less than $150,000,000, predicted Burnham Finney, editor *American Machinist*. He said that at least two years of reasonably good sales and production lie ahead of the industry. Russia and France probably will be the largest buyers in the foreign field. Sweden, Holland, Belgium, Turkey, Latin America, China and the British Empire also will yield considerable business. Volume from India and China, however, will be very modest. Builders will be in for some stiff competition in foreign markets, especially from the British.

Criticism of the government for not removing price ceilings altogether from machine tools was voiced by Tell Berna, general manager, National Machine Tool Builders' Association.

New Westinghouse Units

M. W. Smith, Westinghouse vice president in charge of engineering, opened the forum by discussing Westinghouse's new transient analyzer for solving a wide variety of problems in the electrical, mechanical, thermodynamic, hydraulic and other branches of engineering and science. H also mentioned "Refractaloys" developed by Westinghouse for the gas turbine and "Fosterites" for moisture-proofing radar equipment. He said many products developed during the war have opened new fields for application of electric power and control in industry.

W. B. Wigton of the Cincinnati Planer Co., B. T. Anderson of Sundstrand Machine Tool Co., and R. W. Moore of Westinghouse presented papers covering the application of adjustable speed drives to machine tools.

Special Motors

Specially tailored motors for reversing applications were described by A. J. McClelland of Warner & Swasey Co., E. Y. Seborg of Barnes Drill Co., and L. W. Herchenroeder of Westinghouse. Mr. McClelland pointed out a need for improvements in the design of reversing motors, while Mr. Seborg described the use of forced air cooling in connection with a standard reversing motor for a special "duty cycle" application. He suggested that a line of end bells should be designed with an opening for attaching a separate small motor-driven blower. Then, if trouble develops when a standard motor is used on a heavy duty-cycle application, a new end bell with a blower attached could be substituted in the field.

New electrification standards for machine tools were discussed by A. P. O'Neill, assistant plant enginer, Pontiac Division, General Motors Corp., by E. J. Rivoira of Cincinnati Milling Machine Co., and by G. A. Caldwell of Westinghouse. Mr. O'Neill stated that industry is ready and willing to work with the N.M.T.B.A., the N.E.M.A or any other group whose desire it is to help produce better electrification for machine tools and to make the job of maintaining the machine a minor job.

High-speed Movies

Interesting high-speed movies showing the action of magnetic contactors and other apparatus when subjected to shocks were presented by D. L. Pierce of Westinghouse. These movies were taken at 2,000 frames a second with special camera and lighting equipment. When projected at the standard rate of 16 frames a second, this reduces the speed of the photographed motions 125 times. The techniques used were developd during the war to study the shock testing of electrical apparatus manufactured for installation in naval vessels.

Trends in machine tool wiring methods at the plant of Brown & Sharpe Mfg. Co. were described by A. L. Krause of that organization. Present practice is to locate all control units in one enclosure, making certain that space is provided for the disconnect switch and the control transformer.

Standardized control transformers for use in machine tool control circuits were covered by papers presented by E. E. Opel of National Automatic Tool Co., and by C. E. Herr of Westinghouse. Mr. Opel pointed out that sizes and ratings of control transformers now vary with each manufacturer to such an extent that in many applications the installation of a built-in transformer requires special engineering. If uniform characterstics, sizes and shapes of these transformers can be agreed upon, machine design can be simplified.

Washington Bulletin

Service Unification Lags

Unification of Army, Navy, and Air Forces under a Secretary of Defense, approved recently by a Senate Military Affairs sub-committee, apparently cannot stop jealous bickering between the armed forces. Mere discussion of the issue is fomenting the worst intramural service rows in history. But from industry's point of view, unification will bring about important standardization of military equipment components and parts by the thousands. Some of these standardizations and codifications may revert back to industry. For example, the Navy's present codification of antifriction bearings is being resisted by a few manufacturers, but others say they will try to have it adopted by all producers and users in the U. S., and perhaps abroad. There is little chance that unification of the three military forces will be concluded by this session of Congress.

Annual Wage Report

A report on existing annual wage plans may be issued this Fall by the President's Guaranteed Annual Wage Commission. Data now being gathered by Labor Department's Bureau of Labor Statistics indicate previous reports were incomplete and inaccurate. The Commission now has only $50,000 to work with, hopes to get $200,000 from Congress, to make studies on (1) existing wage plans, (2) production regularization and employment stabilization, (3) integration of annual wage guarantees with social security, minimum wages, etc.

More OPA Relief Sought

OPA's order decontrolling prices on approximately one-third of total machinery and equipment output is the first step in further price control suspension. Machinery groups, working with Congress for removal of price ceilings, knew all along that another equipment category being considered for price freedom is the oil machinery industry. Suspension of ceilings for other industries and classes of producers' goods is definitely under study. Machinery and machine tool industries are continuing their plea before Congress for complete relief, and they hope and expect that the resulting threat from Capitol Hill will bring about their objective through administrative action by OPA. They are telling Congress (and OPA) that because machine tool price lists in effect were actually established in 1939 and 1940, the cross-the-board 20% price increase will not offset current increasing costs for labor in machine tool plants and the plants of their suppliers.

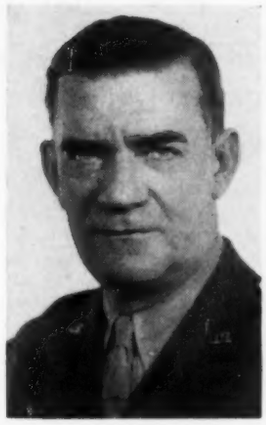
Finding Surplus Motors

Shortage of electric motors for machine tools has the industry searching in dark corners. War Assets Administration in several cases has found suitable motors on un-saleable machines and has released them. One fairly large haul came from a boring mill producer, who had accumulated a ten years' supply. The search continues but it is difficult to find motors of suitable size, speed, and voltage. Most industries have special motors that are not transferable to others. Laid-up merchant ships use mostly direct current.

Completing Your Expansion

Here's what you can do about industrial buildings under the joint CPA-Housing Authority order, giving priority to veterans' homes. If the proposed building will cost less than $15,000, go ahead and build it if you can get the materials and the manpower. If the building will cost more than that, make application for permission to go ahead. Winning arguments are: the job will ease local unemployment; the local housing situation is not tight; the proposed plant is necessary to rapid reconversion. If work has already begun, it is best to get approval on it.

New Ordnance Chief



Maj. Gen. E. S. Hughes

Maj. Gen. Hughes, new Army Ordnance Chief, succeeds the retired Lt. Gen. L. H. Campbell

Other Developments

Commerce Department predicts greatly increased use of aluminum, especially by transportation equipment industry in trucks, buses, and streetcars.

House Military Affairs Committee has approved a revised Senate-approved measure, sponsored by the Army, providing a national program for stockpiling strategic materials, to be administered by the Army-Navy Munitions Board.

New Czech Car—Czechoslovakia's noted Skoda works has been sufficiently repaired to permit production of Skoda cars on an assembly line basis

New Cost-Saving Equipment Exhibited at ASTE Exposition

Domestic and foreign tools incorporate many far-reaching innovations. Engineers enthuse at new items in 340 exhibits

CLEVELAND — Acutely cost-conscious tool engineers viewed with enthusiasm the many new developments displayed at the fifth Exposition of the American Society of Tool Engineers held here from April 8 to 12. Keyed to the theme "How to produce goods at lower cost while industry is paying higher wages," more than 340 exhibits displayed new or improved products to the 50,000 visitors who circulated through the Public Auditorium.

A good number of machine tools were displayed despite the absence of those made by members of the National Machine Tool Builders Association. Exhibits in this category were sponsored by domestic non-members and by foreign manufacturers—Swiss and Swedish.

Revolutionary Screw-Machine

Possibly the most revolutionary domestic offering was the "Vertimatic," a single-spindle vertical screw machine developed by Rheem Research Products, Inc. The machine is controlled by a paper tape prepunched for the cycle of operations and time intervals. The rolls of tape may be filed for reuse when the same design of part is machined again.

Sunnen Products Co. has adapted its line of honing machines for use on holes as small as ⅛ in. in diameter. Larger holes, with a 1-in. minimum diameter, can be honed to a length of 18 in. The DoAll Co. featured an all-purpose grinding wheel and precision-ground flat tool steel, preinked for easy layout.

A small bench lathe for toolroom and second-operation work was displayed by the Gilman Instrument & Mfg. Corp. The machine has ground lead and feedscrews, and can be supplied with a tool turret.

The Walker-Turner Co. exhibited a metal-cutting bandsaw with variable-speed drive and an automatic feed that slows up if saw pressure becomes excessive.

New Grinders, Drills

Oscillating heads for mircrofinish were offered by The Grenby Mfg. Co. on its line of internal and external grinders.

Zagar Tool, Inc., showed a new multiple-spindle drillhead which gives close center distances without the use of gears. Up to 300 drills can be provided for in a single head.

The Porter-Cable Machine Co. introduced a backstand unit for converting a standard tool grinder for use with abrasive belts. The stand can be used either vertically or horizontally.

Nos. 1 and 1½ vertical milling machines were displayed by the Somer & Adams Co. These machines have heat-treated alloy-steel spindles and gears.

Automatic Saws

A number of booths featured cut-off machines. For example the Andrew C. Campbell Div., American Chain & Cable Co., showed an abrasive saw with automatic clamping, automatic wheel feed, positive speed adjustment for wheel wear and automatic ejection. Motch & Merryweather had a fully automatic cold saw for 1-in. round or square stock.

The "Millgrinder," exhibited by the Monroe Tool & Mfg. Co., gives quick stock removal from flat surfaces by means of a cupped wheel. A magnetic brake gives a rapid cycle.

Many new tool and cutter grinders were introduced at the show. Among them was the spiral point tap grinder displayed by the Edward Blake Co. The Wardwell Mfg. Co. offered an automatic universal flute grinder with a quick-loading clutch and automatic stop. The D. S. tool grinder, made by the Royal Oak Tool & Machine Co., has an ingenious arrangement for giving axial and radial relief simultaneously.

Plastic, Powder Press

A new press for plastic preforms or powder metal parts was shown by the Dennison Eng. Co. The machine was provided with vibrating shuttle feed, vibratory ram and hydraulic injection.

The Hydraulic Mfg. Co. showed an aircraft propeller test stand which checks the hub for leaks, feathering, blade contours, regulator, and governor.

Induction-heating units exhibited by Allis-Chalmers had an 8-position circuit feed for a brazing application. This company specializes in work-handling devices for induction heating.

Automatic Gaging Units

Industrial interest in automatic gaging and sorting equipment for mass-produced parts was evidenced by well-attended exhibits of five companies in which such devices were displayed. Largest of these was an air gaging machine for auto engine cylinder blocks made by The Sheffield Corp., for Buick. In 8 sec. this machine checks eight cylinder bores at four points simultaneously (32 dimensions) for diameter. At the same time it checks each bore for taper and out-of-roundness.

Pratt & Whitney, Federal Products, and Jack & Heintz exhibited automatic gaging and sorting machines for measuring diameters of balls and pins

ASTE Officers—C. V. Briner (left), retiring president, greets new ASTE officers (l. to r.), A. M. Sargent, president; W. B. Pierce, 1st vice-president; and T. P. Orchard, 2nd vice-president

At Houghton Exhibit—E. F. Houghton & Co. men shown are (l. to r.), C. R. Schmitt, asst. mgr., Lub. Dept., D. C. Miner, Ad. mgr., F. Ross, mgr., Lub. Dept., and H. E. Martin, Detroit sls. mgr.

Enjoying The Show—(l. to r.) C. W. Deeds, pres., Pratt & Whitney Div., Niles-Bement-Pond; J. G. Manuele, dir. of qual. cont., Westinghouse; A. H. d'Arcambal, vice-pres., Small Tools & Gages Dept., Pratt & Whitney Div. At right (l. to r.), Carl J. Oxford, Jr., C. J. Oxford, ch. engr., National Twist Drill & Tool Co., and S. B. Hellstrom, vice-pres. & mgr., Detroit Tap & Tool

and then classifying them into groups for selective assembly operations. Each of these units incorporates an electronic control circuit which permits operation at high speed. In one case, speed of sorting is 7000 to 8000 per hour. Pollak Mfg. Co. displayed a limit-type electronic comparator adjustable to gage pieces with tolerances ranging from 0.0001 to 0.030 in.

A "SIP" universal profile projector exhibited by Cosa Corp. has diascopic illumination for profile gaging and episcopic illumination for surface projection of opaque objects.

Electric Comparators

A number of air and electric comparators were shown by Sheffield Corp., including a "Precisionaire" unit developed for checking precision gage blocks at an amplification of 50,000 to 1, with each graduation equalling one millionth of an inch. This instrument uses an air jet in the lower anvil as well as in the adjustable head, eliminating the need for "wringing" the gage block to the anvil before checking its height.

Johnson Gage Co. showed several new production thread gages in hand-, treadle-, and motor-operated models for large-lot external thread-checking operations. For rapid inspection of threads in tapped holes up to 1½-in. dia., Pratt & Whitney introduced a power gaging unit in which a flexible shaft rotates a thread plug gage at speeds from 300 to 475 rpm., depending on diameter.

Tool Adjustments

Pacific Aviation, Inc., has a drill-head which has an air-hydraulic feed for advancing the drill to a preset depth, then withdrawing.

Beaver Tool & Engineering's quick-change toolholders for all types of milling and boring machines need only a simple turn of a locking ring to give rigid holding, quick release.

Wesson Co. has face mills in which one size of blades is used in all cutter bodies. With a serrated base, the blade is held in place by a serrated wedge.

Internal grooving tools were displayed by several concerns, including Lyon Machine Co., Gairing Tool Co., and Waldes Kohinoor, Inc. Waldes also displayed the Truarc retaining rings, a new design used to position moving parts.

Light Tool Developments

Makers of lightweight tools were on their toes, with the emphasis on lightness and ease of operation without sacrificing power. Shown for the first time were tools operating on 360-cycle ac. made by Buckeye Tools Corp. and Chicago Pneumatic Tool Co. Use of the high-cycle current brings the weight of electric tools close to that of pneumatic tools.

Independent Pneumatic Tool Co. demonstrated an impact wrench which applies or removes nuts up to ⅜-in. thread size. The impact jaws present a new face to the anvil for each blow to give automatic compensation for wear. Impact wrenches were also among the complete pneumatic lines shown by Ingersoll-Rand Co., and Aro Equipment Co.

A method of cold treatment suited to intermittent operation was introduced by Super Treat Inc. Using simply a dry ice and vacuum pump cooling system, the unit can reach—130 F. in 2 hr.

Coolant will not leak into the electrical system of machine tools with the electric conduit displayed by Chicago Metal Hose Corp. The metal conduit is coated externally with a flexible synthetic case.

Helpful Materials

Allegheny Ludlum Steel Corp. has an easy machining tool steel, Dunkirk E-Z, for dies, gages, bodies for multi-edged tipped tools, and other uses. Fansteel Metallurgical Corp. demonstrated Fanweld, a hardfacing material applied by welding torch or arc which needs no heat-treatment.

Carboloy Co., Inc., exhibited a solid carbide boring bar which had been used to bore wristpin holes in aircraft pistons. The hole depth was 7.3 times bar diameter and finish-boring to precise limits was accomplished in two operations, where four had been required with a steel bar.

Among abrasive displays were the Bayflex wheels of Bay State Abrasive Products Co., which have increased flexibility. The Allison Co. displayed abrasive tube cutters for cutting holes in glass, plastic, and ceramics, which can be used in a standard drillpress. Of interest was Simonds Abrasive's musical grinding wheels, a xylophone-type instrument demonstrating how wheels can be graded by the musical tone they emit.

NEW ASTE OFFICERS

CLEVELAND—A. M. Sargent, president, Pioneer Engineering Co., Detroit, was installed as president of the American Society of Tool Engineers at the banquet in conjunction with the society's annual meeting and exposition. Other officers elected by the Board of Directors are: First Vice President, W. B. Price, vice president, Flannery Nut & Bolt Co.; Second Vice President, T. P. Orchard, general manager, American Tool Eng. Co.; Third Vice President, Irwrin F. Holland, general supt., small tool and gage dept., Pratt & Whitney Div., Niles-Bement-Pond Co.; Secretary, R. B. Douglas, works manager, Propeller Division, Canadian Car & Foundry Co., Ltd.; Treasurer, V. H. Ericson, vice president, Johnson-De Vou, Inc.

Wickman Corporation exhibited steel-bonded diamond grinding wheels. Also in the diamond field, Ace Abrasive Laboratories showed a pure diamond powder and lapping compound made by methods giving more uniform particle sizes.

Kennametal, Inc., demonstrated a Madison-Kipp hand grinder with bearings of Kennametal.

Accessory Innovations

While no radical changes were made in duplicating attachments considerable progress has been made in application and technique. Turchan Follower Machine Co. in working-model demonstration displayed the automatic step turning of shafts and undercutting for grinding, using a single-point tool. Bailey Meter Co. introduced a combined air and hydraulic duplicating attachment for use with engine lathes, turret lathes and vertical boring mills. Automatic sizing of tapers and radii is provided.

Dorr Sales & Engineering Co. demonstrated its Clocenter drillhead, with 18 drills feeding from the spindle and set with cam action and the unit is drilling 3/32 in. on centers. Drills are run off three gears in reverse action.

Greenleaf Corp. showed a redesigned model of its Metal Disintegrator, removing broken taps and drills from the harder metals. A new solenoid arrangement gives guaranteed continuous action.

In the field of dieless duplicating O'Neil Irwin Manufacturing Co. introduced the Di-Arco Brake No. 4, designed for forming extremely close reverse bends. Special materials clamping action, a percision angular stop and vertical forming plate were added new features.

Redmer Air Devices Corp. showed new models of the air-operated collet, featuring a simplified indexing system, with a fast action.

C. B. Hunt & Son, Inc., showed a line of modified air valves, which can be grouped in manifold type heads to obtain diversified areas and valve actions. All sliding sleeve-type valves are equipped with stainless steel bodies and brass sleeves.

Mueller Engineering Co. introduced the New Era hydraulic machine, with an automatic hydraulic stripping action which eliminates shock and makes it possible to pierce high-tensile and high-carbon materials. No springs or rubber cushions are required in this type of stripping.

Anker-Holth Manufacturing Co. displayed a heavy-duty mill-type air cylinder, through-bolted and built for rigidity in steel-mill application. Air piston packing is self-adjusting.

Automatic Lubricators

Gray Co., Inc., displayed a line of automatic cup-type lubricators featuring pre-determined lubricant feed and interchangeable positive pressure valves. The Briggs Filtration Co. showed a line of reclamation units, including a fully automatic motor-driven unit for individual machine installation.

Modernair Corporation displayed a cushion-type air cylinder with interchangeable mounting bracket and the elimination of tie rods intended to simplify the servicing.

The Doall Co. "Selectron" for controlling the holding power of magnetic chucks has been streamlined and a supplementary tube arrangement guarantees holding power even if all tubes but one were to blow out.

Salsbury Motors, Inc., displayed a clutch with automatic centrifugal action, which prevents undue shock by a retarded clutching. The device also automatically engages and disengages with increase of machine or engine speed.

Greater flexibility in feeders for automatics was indicated by a line of feed-finger adapters now being introduced by Sutton Tool Co., quickly reducing the capacity of machines for runs of smaller stock.

Vinco Corp. showed the Vinco optical master inspection dividing heads in a variety of inspection set-ups in addition to an increased line of gear and spline checking devices.

Munton Mfg. Co. featured double-action pedal control on their line of presses. Added safety and control resulted from this toe and heel operation. The Lectrotech Co. included in their operating displays an electrolytic stencil etching process, operating with both bench and pen units for marking finished metallic surfaces.

Lawson and Lescke Co. exhibited an attachment for grinding radial relief diameters with a minimum of land or with sharp edge.

PACKARD PRESIDENT ATTACKS PRICE CONTROL

CLEVELAND — No automobile company would be so foolish as to price itself out of competition if restrictions were removed, George T. Christopher, president and general manager, Packard Motor Car Co., told tool engineers at their annual banquet held here April 10. If government insists on some control, he said, it should set up such controls as will permit a reasonable profit from good management and will establish equal responsibility on the part of union and industrial managements.

Packard started production of finished cars April 15.

Heavy tooling expense will be necessary in the next 18 months, he predicted, to give efficiency to offset rising labor costs. Present price policies do not permit writing this expensive tooling off in the comparatively short periods before model changes may make it out of date. This will be one of the major problems to be faced by the automotive industry unless government controls are eased, he declared.

Canadian CIO Ready to Attack Wage Control; Steel Strike Threatened

OTTAWA—The Canadian Congress of Labor (CIO) is preparing to attack the Dominion's wage control policy by widespread demands for wage increases, holidays with pay, and reduced hours. The program will likely be spearheaded by a strike in Canada's steel industry. The CCL favors continuance of price control, but will demand the removal of wage control. In contrast to this, the Trades & Labor Congress of Canada (AFL) wants both price and wage control continued, so long as pegs are removed from sub-standard wages.

The threatened steel strike here would only complicate the problem of steel consuming industries, already handicapped from shortages resulting from the U. S. strike. Moreover, Canadian steel mills may have to curtail operations because of the coal shortage. All Canadian mills, except Dominion Steel at Sydney, N. S., depend on American coal.

A shortage of scrap in the Dominion has caused the government to resume its wartime scrap gathering appeals. This shortage prevents the charging of cold metal in open-hearths to conserve on coal at the blast furnaces.

Price Ceilings Eased

Meanwhile, the Wartime Prices and Trade Board has authorized price increases in a number of commodities in short supply, notably steel, which has been granted a $5 a ton increase. At the same time, efforts to decontrol prices on non-essential commodities are being intensified, following a survey which revealed that no important or unreasonable price increases had occurred on items decontrolled.

The Joint Inspection Board of the United Kingdom and Canada which at one time had offices in New York, Washington and Detroit, and whose inspectors had worked in scores of American plants, has been disbanded. Disbanding means withdrawal of the British section of the board but the organization will continue on a reduced basis as a Canadian board. It will be responsible for inspection of supplies ordered for peacetime forces and for military supplies.

Dealers Look to New Tools to Hold Sales and Dealerships

CLEVELAND—Machine tool dealers are looking forward to new types of tools for a chance to continue to hold up favorable sales volumes, and maintain sound relationships with the manufacturers. Machine tool dealers are confident that new time-saving tools could obsolete many existing tools, thereby offsetting the threat to sales presented by surplus tools.

Dealers are awake to the current reshuffling of some accounts by some manufacturers attempting to save on dealer commissions. Active and wide-awake representatives have either replaced lines taken away from them, or, have been reengaged by the same tool builders they formerly represented. Dealers say that such builders reported that maintaining their own exclusive sales force cost them about 27%, and did not aid sales noticeably.

Surplus Sales Trouble

Dealers have found surplus tools a headache, in their attempts to handle surplus sales on a commission basis. The commission is generally regarded as too low. However, most dealers are going along with surplus tool sales, convinced that surplus customers will be potential buyers of new and better tools later on. Besides that, dealers are doing yeoman work in finding surplus units made by their manufacturers, determining that it is in adequate condition, and helping to place it where it will do the particular manufacturer the most good.

Until recently, uncertain prices were a headache in making sales, especially on items with extended delivery on which the builder held the option of increasing prices before delivery. The OPA action on prices has eliminated this problem. But dealers wonder whether it will affect sales substantially.

Deliveries A Problem

Deliveries have also been a sales handicap. Many tool builders have had their production schedules so upset that delivery promises are meaningless. In the plant of one Cleveland company stands a double row of tools, extending the length of one side of a large-sized building, complete and ready for shipment except for two or three small but necessary electrical parts. In other shops, it is bearings that are holding up production and shipment, in others it is castings or steel.

Fortunately for the industry, most dealers refuse to be discouraged by these various difficulties, and remain confident in their ability to sustain a favorable level of sales.

Spotting the Air News

Postal Boom to Aviation

A quarter-century of hope and talk has been realized in a Post Office Department report recommending gradual "aviationizing" of its mail service —flying all first class mail on trips longer than overnight train runs— which would increase airlines' revenue by about $81,000,000 per year. Neither airline nor PO handling facilities are available, and would be gradually built up. This program will greatly increase the demand for cargo planes. One model being readied for such service is the Fairchild C-82, which has clam-shell doors in its rear end, for loading at truck level.

Remote Control Testing

Remote radio control for testing new model airplanes, so that they can be put through maneuvers at maximum stress without risking the life of a pilot, seems assured for the future. A radio-controlled Lockheed P-80 will be given a series of power dive tests to prove maximum speed, at the Army's Muroc desert field in California. The "mother" plane will be another P-80.

Sweepback Propellers

Propeller tips are being designed with sweepback similar to that used in wings to overcome efficiency loss due to shock wave, which is caused by air compressibility—piling up of air in front of airfoils at supersonic speeds. NACA and other investigators have shown that sweepback tips, combined with thin wide blades extending directly to the spinner hub, can raise efficiency from 60% to 88% at 530 mph.

Folding Wings Deferred

Suggestion by CAA that producers of light airplanes install folding wings to save expensive hangar space received a cold reception. Folding wings were perfected 20 years ago, but customers disliked the cost and the folding chore. Manufacturers don't want to add the cost of folding to present prices, which are too high.

Stationary Power Plants

Evans Products Company, Detroit, has designed and built a stationary electric power plant, with surplus air-cooled radial aircraft engine, cooling blower, and instrument panel all in one unit. One unit shown uses a Wright 450 h.p. engine. It is recommended for industrial purposes in undeveloped regions of the world.

Reducing Turbine Speed

Nuttall Gearing Division of Westinghouse has developed a new light weight reduction gear unit for aircraft gas turbines. Its ratio of ten to one will reduce turbine speed of 12,000 rpm to propeller rate of 1200 rpm. The new gear, weighing 1/30 as much per h.p. as industrial gears, has a high speed planetary train which transmits to a low speed planetary, all in a unit housing.

New Landing Gear Actuator—A new quick-action actuator unit is being inspected by Robert Person, group leader of the Boeing engineering landing gear unit. It is capable of retracting the landing gear in less than 9 seconds, and eliminates excessive drag, thus enabling planes to take off from shorter fields with greater safety. It is being installed on the 80-passenger two-deck Boeing Stratocruisers

Russian Machinery Output to Expand; To Make More Transportation Equipment

MOSCOW—A progress report on Soviet heavy industry reveals that production of mining and agricultural machinery, transportation equipment, and ferrous and non-ferrous metals will expand considerably in the course of 1946 with completion of of a number of industrial construction projects initiated just before or right after cessation of hostilities in Europe.

Realizing that intensive and large-scale exploitation of the country's tremendous coal reserves would be basic to an accelerated post-war industrialization program, the Soviets during 1945 began construction of 14 new plants for manufacture of mining machinery and equipment.

A number of factories built for production of Red Army tanks have been converted to locomotive and railway car works. The Kolomenskoye Engineering Works near Moscow and plants at Voroshilovgrad and Bryansk are now turning out new "Victory" type engines, claimed to be faster and less fuel consuming than older types and suitable for both heavy duty and light track. Production of diesel type locomotives also is slated to be launched soon. A new shop for manufacture of railroad tank cars is being added to the Ilyich plant at Maiupol in the Ukraine. Four-axle box cars and gondolas of the pre-war type will be produced at an accelerated pace to make up for drastic war losses in rolling stock. For this purpose facilities are being expanded at plants in Kalinin, RSFSR, Dnieprodzerzhinsky on the Dnieper River and at Kolomna and Kriukovo, both near Moscow.

50% More Cars

A 50% increase in production of trucks and cars has been set as the 1946 goal of the Soviet auto industry. The Stalin plant in Moscow will produce a new 3.5-ton truck known as the ZIS-150. Equipped with a heavy-duty engine, it has five speed transmissions and pneumatic brakes. New models for the Molotov plant in Gorky are the 2.5-ton GAZ-51 and the 2-ton GAZ-63, both designed for operation over undeveloped roads. Most ambitious truck development will be the 5 to 7-ton diesel-powered YAAZ-200, for which the Yaroslavl plant is now being expanded and tooled. The Stalin plant will produce a 7-passenger limousine, while the plant at Gorky will make a 5-passenger model. The already announced low-powered 4-passenger job known as the Moscovite will be turned out in Moscow. All these plants are undergoing expansion. In addition, large plants are being erected at Ulyanovsk on the Volga River in RSFSR, and at Dniepropetrovsk on the Dnieper River in the Ukraine. A number of assembly plants are being built elsewhere.

The first section of a harvester factory at Krasnoyarsk at the head of the Yenisei River in Siberia has been completed. Cultivating machines are to be made at a factory under construction at Rubtsovsk in Altai Krai. Sorters, reaping machines and cultivators will be manufactured in a new plant at Akmolinsk in Kazakhstan. The first shops of the Uralselmash plant at Kurgan in the Ural mountains have begun manufacture of threshing machines and sorters. Plants for production of flax machinery are being erected at Bezhetsk in Kalinin province and at Kamensky in Penza province.

Tractor Plants Restored

Two large pre-war tractor plants at Kharkov and Stalingrad have been restored. In addition to the traditional type of cultivator and caterpillar tractors now in production, a new medium-power caterpillar type with diesel engine will be produced. Construction of new tractor plants is progressing rapidly at Rubtsovsk, at Lipetsk in Voronezh province and at Vladimir between Moscow and Gorky.

The iron and steel combine at Magnitogorsk in the South Urals leads all other enterprises in this field for new construction. Several concentrating plants, and four new open hearth furnaces have been built. A new coke battery was placed in operation in 1945 and several existing batteries have been undergoing reconstruction.

The rolling mill of the Azovstal metal plant at Mariupol is another large construction project nearing completion. In addition to restored blast and open hearth furnaces, the plant will gain a blooming mill of 1,600-ton capacity, largest in the Soviet Union. The Chelyabinsk plant in the Ural mountains is undergoing expansion and a number of new shops have been added to the pipe-rolling plant there.

A large new pipe mill is nearing completion at the tube and pipe plant at Nikopol in the Ukraine. Rolling mills are being added to the metallurgical plants in Uzbek and Kazakh Republics. A new iron and steel plant is almost ready for operation in Transcaucasia. Blooming mill production has been started at restored Stalin machinery plant and a new blooming mill at Kramatorsk marks the first in a series of such installations planned for erection in the next five years.

Production of non-ferrous metals has expanded in several plants. The Severonickel combine on the Kola peninsula had been restored by the beginning of this year. The Volkhov aluminum plant near Leningrad also is back in production. A mine and concentrating plant of the Tekeli lead-zinc combine has opened in southern Kazakhstan. The electrolysis department of a new aluminum plant at Bogoslovsk in the northern Urals began to produce the day war ended.

Aluminum Output Up

Significant expansion of aluminum production occurred during the war years in Kamensk in the Ural mountains and in Stalinsk in the Kuznetsk basin in Siberia. Rolling mills for non-ferrous metals were built in the Urals and in Kazakhstan. Enterprises for extraction of rare metals were put in operation in Kazakhstan, Kirghizia in the Kirghiz Republic and Siberia. Most ambitious undertaking in respect to exploitation of non-ferrous metal production is the new copper mining and smelting center being developed in Dzhezkazgan, where geological surveys indicate exists one of the world's greatest non-ferrous ore deposits.

WESTINGHOUSE BUYS SURPLUS PLANT AND TOOLS

BUFFALO—Westinghouse Electric Corp. has purchased $600,000 worth of machinery and equipment in the government-owned plant formerly operated by Curtiss-Wright Corp. here. Westinghouse has also taken title to the entire plant.

Westinghouse paid the government $9,600,000 for the plant, which originally cost $18,000,000, and also paid out a check for $600,000 for machinery costing the government more than that amount originally.

Strikes have upset the company's plans to start production in March, and its opening will depend upon the settlement of current difficulties with the CIO. Meanwhile, Westinghouse is merely modifying the plant to suit its needs and installing cranes and rail tracks.

Progressive Foundry Sold

ROCHESTER—American Brake Shoe Co. has purchased the Progressive Foundry Works here, producers of specialty gray iron castings.

Modern Industrial Safeguards Feature N. Y. Safety Exposition

NEW YORK—Panel discussions on industrial safety programs highlighted the 16th annual safety conference and exposition sponsored by the Greater New York Safety Council on April 9-12 at the Hotel Pennsylvania, New York City. Modern safety and accident prevention equipment and materials were displayed by more than 100 exhibitors.

M. S. Dickenson, safety director of the Wright Aeronautical Corporation, warned that safety standards in many American favorites have deteriorated since the end of the war. He pointed to the elimination of safety departments in many industrial plants and stated that those departments remaining must become more active.

"The general theory has been that safety is intangible," he declared. "For everyday use it is. You cannot put a guard on a machine and tell management that guard is going to save a set amount of money. But, when you take the 1944 and 1945 accident cost figures and show a large decrease in 1945, there is nothing intangible about that."

38% Have Bad Eyes

Announcing that 38 of every 100 industrial employees are visually deficient, Fred W. Staubach, O.D., of Toledo, O., urged upon management more detailed preemployment eye tests than are general at present. He said this would lead to more efficient job placement, with increased production for management and better sight conservation for employees.

One session dealt with absorbing veterans into industry, with particular stress on disabled veterans. One paper covered what the service and veteran hospitals do to rehabilitate veterans prior to and after discharge, and their plans for cooperating with industry in continuing treatment where necessary.

New Industrial Films

The Fellows Gear Shaper Co., Springfield, Vt., has issued a two-reel, 16 mm. sound film in colors on **"The Art of Generating and Gear Manufacturing Equipment."** The theory, action, design, and manufacture of gears is explained. Running time, 29 minutes. Films may be loaned free from the company's Publicity Department.

The Chicago Chapter of The Society for The Advancement of Management, 426 S. Maple Ave., Oak Park, Ill., has now made available, after five years' work, **"The Original Films of Frank B. Gilbreth,"** noted motion study expert. The 1200 ft., 16 mm. silent film is being offered for $75 to defray costs.

Names in the News

George W. Frick

Henry A. Stix

George W. Frick is the newly appointed executive vice president of Carbide Die & Mold Co., Pittsburgh, Pa. He will also direct the company's sales.

Henry A. Stix, treasurer of The Federal Machine and Welder Co., Warren, Ohio, and its subsidiaries, Warren City Manufacturing Company and Sommer and Adams of Cleveland, Ohio, has been named executive vice-president of Federal operation.

F. R. MacFadyen has been transferred from the Milwaukee office to the Canton Engineering Dept. of the Timken Roller Bearing Co., Canton, Ohio, **Walter F. Green** has been promoted to assistant manager of the company's division of research and development and **J. M. Roshong** has been named superintendent of the division. **Harley J. Urbach** has been appointed works engineer, taking over the former duties of Mr. Green.

W. D. Ligon has been elected works manager of the new Buffalo, N. Y. plant into which the Westinghouse Electric Corporation's Motor Division is moving from East Pittsburgh, Pa. **L. E. Lynde** has been appointed manager of the New England district of the Westinghouse Electric Corp., with headquarters at Boston, Mass. **F. L. Nason,** former manager, will become a special representative of the company in the district. **Franklin L. Snyder** is the newly appointed engineering manager of the Sharon Transformer Div. of the corporation.

Jones Y. Pharr, Jr. has been designated southern representative for New Departure Ball Bearings, New Departure Div., General Motors, Bristol, Conn., with headquarters in Charlotte, S. C.

Daniel R. Seagrave has been appointed superintendent of service and erection in the Seattle Wash. district of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., succeeding the late **R. C. Norman.**

William Beattie is manager of the recently formed Wales-Strippit of Canada Ltd., with plant and sales offices located at 85 Cannon St., West, Hamilton, Ontario.

E. J. Norton has succeeded **J. N. Bohannon** as manager of the Pottstown Plant of the Spicer Mfg. Corp., Pottstown, Penn.

Clarence A. Norris has been appointed chief chemist of the Eaton Mfg. Co.'s stamping division at Cleveland, Ohio.

S. A. Cogsdill, founder of the Cogsdill Twist Drill Co., Detroit, Mich., has been elected chairman of the board and **Floyd Cogsdill,** president. **C. B. Stoerkel** has been advanced from division sales manager to sales manager.

John F. McFeeters has joined the staff of welding engineers in the Kansas City, Mo., office of the Lincoln Electric Co., Cleveland, Ohio. **Hubert G. Hinkle** has been assigned welding engineer in the Columbus, Ohio, area.

Curtis Franklin, Mountain Lakes, N. J., was named president and general manager of Spun Steel Corp., Canton, Ohio, followed the resignation of **W. R. Harrison.**

Albert J. Hulse, formerly with the Carnegie-Illinois Steel Corp., Cleveland, Ohio, has been named chief engineer of the Youngstown Sheet and Tube Co., Cleveland.

George A. Rentschler, president of the General Machinery Corp., Hamilton, Ohio, was elected chairman of the board of the Philip Carey Mfg. Co., Cleveland, Ohio.

William E. Thomas has been appointed division sales manager in charge of valve sales for the Homestead Valve Mfg. Co., Coraopolis, Pa., in the Southeastern states territory with headquarters in Atlanta, Ga.

C. L. Miller has been appointed purchasing agent of the American Welding & Mfg. Co., Warren, Ohio.

Ralph H. Lightner has been named general sales manager of the Titan Metal Mfg. Co., Bellefonte, Pa., succeeding **J. B. Craig,** vice president, who has been appointed controller.

Mrs. Florence L. Boutet has been elected president of the Farnham

Mfg. Co., Buffalo, N. Y., succeeding her husband, the late **Frank L. Boutet.**

Paul J. Best has been named quality manager of the Crosley Corp., Cincinnati, Ohio, plant. **T. J. Michel,** formerly engineer in charge of test equipment, has been appointed production superintendent Cincinnati plants.

J. M. Hawes has been named manager of the Alamo Boiler and Machine Works, Waco, Texas.

Norman A. Matthews, formerly a Lt. Col. in the U. S. Ordnance Dept., has been appointed works metallurgist of the Electro-Alloys Div. of the American Brake Shoe Co., New York.

Walter Pestrak is representing the Progressive Welder Co., Detroit, Mich., in its new Southeastern Ohio and Western Pennsylvania sales district.

D. Gordon Rupe, Jr. has been elected president and **Ashley DeWitt** active vice-president of the Briggs-Weaver Machinery Co., Dallas, Texas.

Charles U. S. Grant has been appointed sales engineer in the Cleveland, Ohio, office of Foote Bros. Gear and Machine Corp.

George H. Adams, formerly executive vice president of The Bunting Brass & Bronze Co. of Toledo, Ohio, has been elected president, succeeding **Charles E. Bunting,** newly appointed chairman of the board of directors.

Capt. Nelson W. Pickering, USNR, has been named executive vice president of Republic Industries, Inc., New York, control of which was recently acquired by the Barium Steel Corp. of New York.

Harry W. Fink has been appointed resident manager for the New York branch office of LaSalle Engineering Co., Chicago, Ill.

Thomas V. Scott, Dan W. Holmes, James A. Strachan, L. C. Doolittle have been appointed divisional sales managers to cover sales of the Weatherhead Co., Cleveland, Ohio.

E. B. Nisbet has been named president of the Laminated Shim Co., New York, following the recent death of its founder and president, **Carlton N. Aborn.**

O. J. Richardson has been appointed industrial manager of the Brown Instrument Co., division of Minneapolis-Honeywell Regulator Co. at Detroit, while **George W. Brown** has been appointed industrial manager of the Cincinnati office.

BUSINESS ITEMS

E. & N. Tool Design and Drafting Engineering firm, with temporary quarters at 531 East Seventh Street, Galveston, Texas, has been organized by **Hugh H. Eddlemann,** recently discharged from the army signal corps, and **Eddie Nicklow.**

Sperry Corp., New York, has acquired the assets and business of the **E. G. Staude Manufacturing Co.,** St. Paul, Minn., now to be operated as a division of Sperry.

Chicago Flexible Shaft Co., Chicago, Ill., changed its name on Feb. 27 to **Sunbeam Corp.** Coincident with the name change, the **Stewart Industrial Furnace Div.** will be redesignated the **Sunbeam Stewart Industrial Furnace Div. of Sunbeam Corp.**

Dayton Chemical Products Laboratories Dayton, Ohio has just been started by **Stewart L. Brams,** and will be located at 1150 W. Second St., Dayton. Mr. Brams was the inventor of the Inland adhesion process. He was associated with the **General Motors Inland Manufacturing Div.**

Harris-Seybold Co., Cleveland, Ohio, has disposed of their interest in the Morrison wire stitcher business to the **Acme Steel Co.** of Chicago, Ill.

Cinch Manufacturing Corp., Chicago, Ill., has purchased the **Howard B. Jones Co.,** Chicago, which will be known as **Howard B. Jones Div.**

The American Gauge Co., Dayton, Ohio, has changed its name to **The American Gage and Manufacturing Co.**

Henry & Hutchinson, Inc., Decatur, Ga., has been recently organized and equipped to engineer, design and build complete tooling programs and all types of special machinery.

Marquette Machinery Co., Detroit, Michigan, has new quarters at 2406 Guardian Bldg., Detroit.

The Reading Division of Atlantic Plastics, Inc., Reading, Pa., has been operating under the name of **The Polymer Corp.,** since April 1. The new company will be an affiliate organization instead of a division.

The Sharon Transformer Div. of the **Westinghouse Electric Corp.,** Pittsburgh, Pa., has recently organized a Specialty Transformer Dept. **Chris H. Bartlett** has been appointed manager.

The S-P Manufacturing Corp., organized under Ohio laws, has the acquired assets and business of the **S-P Manufacturing Co.,** Cleveland, Ohio. **H. Lee Bassett** is president and treasurer.

Hammond Manufacturing Corp. is the new name of the **Pacific Fabricating Co.,** Los Angeles, Calif.

OBITUARIES

Lee A. Daines

Lee A. Daines, 52, vice president and general sales manager of Heppenstall Co., Pittsburgh and Bridgeport, Conn., died suddenly March 29 in Miami, Fla. In 1923 Mr. Daines joined Heppenstall Co. and was assigned to the Detroit office. A few years later he was transferred to the company's Chicago office where he was district manager until almost a year ago when he was elected to the position he held at the time of his death.

Martin L. Davey, 61, treasurer and director of the Davey Compressor Co., Kent, Ohio, died March 31 at his home in Kent.

Frank B. Parker, 56, chairman of the board of directors of the Iron and Steel Products Co., Chicago, Ill., died March 17 in that city. Mr. Parker, who founded the Company in 1920, served as its president until 1943, at which time he retired to become chairman of the board.

MEETINGS

Machinery Dealers' National Association. Annual convention. Claridge Hotel, Atlantic City, N. J. May 29-31. R. K. Vinson, executive director, 20 North Wacker Dr., Chicago 6, Ill.

Society of Automotive Engineering. Semi-annual meeting. French Lick Springs Hotel, French Lick, Ind., June 2-7. John A. C. Warner, secretary and general manager, 29 West 39 St., New York, N. Y.

Society of the Plastics Industry. National Plastics Exposition. Grand Central Palace, New York, N. Y. April 22-27. W. T. Cruse, executive vice president, 295 Madison Ave., New York 17, N. Y.

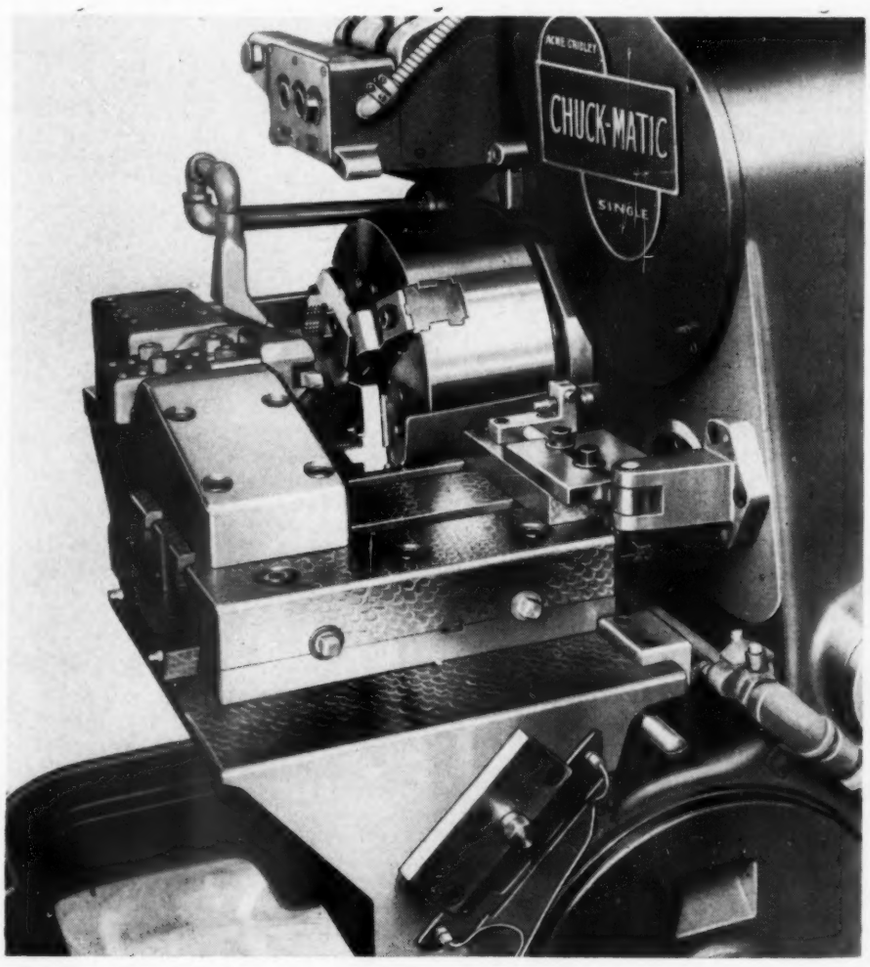
Shop Equipment News

National Acme Chuck-Matic Has Sturdy Design, Simple Operation

A radically different type of single-spindle machine, the 12-in. Chuck-Matic, is announced by The National Acme Co., 170 E. 131st St., Cleveland 8, Ohio. This automatic chucking machine will handle production machining operations on castings, forgings, and tubing parts up to 12 in. in diameter.

A single air-operated chuck holds the work. This is controlled by a pedal. The machining cycle is fully automatic. The operator is always in position at the front; all controls are operated and the work is chucked from this position. One person may operate as many machines as the cycle time of the job will permit.

Two main castings are used. The heavy pan and one-piece frame are doweled and bolted together as a rugged, compact unit, which with motors, toolholders, slides, and other essentials make a machine weighing 7,350 lb. The machine is 45 in. wide, 64 in. long, and 64 in. high.



Work is loaded in the air-operated chuck of this Chuck-Matic by hand, then all machining operations are automatic. Designed for carbide tooling, there are two tool slides proportioned to handle heavy cuts

The machine is designed for all-carbide tooling. Relatively large-diameter forgings and castings can be used to obtain the high surface speeds often needed for efficient carbide-tool operation. The stubby, compact frame absorbs the powerful force needed for high-speed cuts in tough alloy materials at heavy feeds.

Cutting tools are mounted on the compound slide and cross slide positioned opposite each other on the machine's frame. These slides are set on an angular-type base and supported in the frame without overhang.

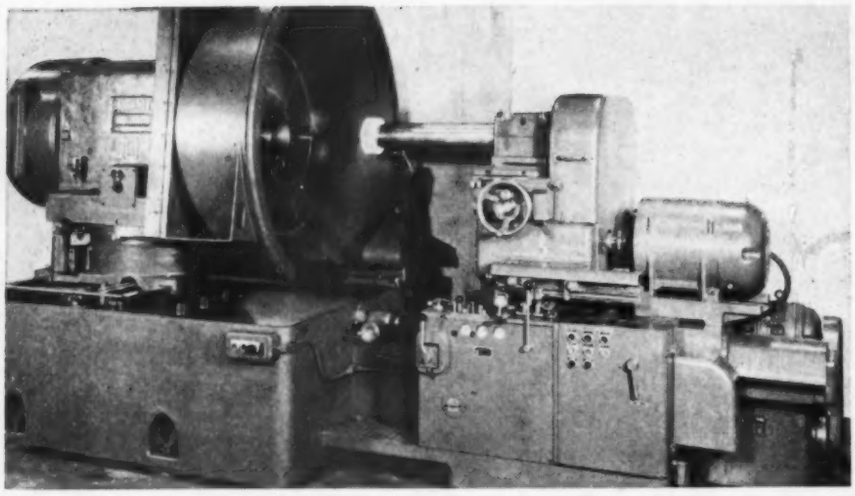
The compound slide at the right-hand side of the machine carries tools for straight or taper boring, form boring or form turning, drilling, reaming, or grooving. Maximum boring length is 3½ in., turning length 4 in. End-working tools return distance for chuck clearance is 6 in. Moving in two directions during the operating cycle, the compound slide approaches working position at high speed by moving longitudinally to the point where cutting is to start, then in towards the work. When ready to start the actual cut, slide movement is shifted to low working speed.

The cross slide, located on the left side, contains tools for forming, turning, facing, and chamfering. The cross slide also approaches the chuck at high speed, shifting over to working speed when the starting point of the cut is reached.

A telescoping guard prevents fine chips, dirt, and coolant from accumulating on slide ways, which are angled steeply to permit coolant to wash chips down easily into the pan.

A Snap-lock limit switch is used to keep the foot pedal from operating the air-control circuit to open the chuck while the spindle is in motion. When air pressure falls below an established minimum, a safety valve operates to stop all machine movements, so the chuck cannot release the work accidentally.

To start the machine, the operator must push and hold the safety locking spring plunger with his left hand and pull the starting lever with his right. Consequently the machine's spindle cannot be rotated with the operator's hands still in the cutting zone.



Hardened steel rails are provided for approximate crosswise and longitudinal adjustment of the workhead to suit a wide variety of work in this Bryant large internal grinder

Bryant Chucking Internal Grinder Will Handle Large, Heavy Work

A large internal grinder in which a wide angular adjustment of the workhead is possible is produced by Bryant Chucking Grinder Co., Springfield, Vt. Model No. 150, this grinder has total swing of 60 in., a grinding stroke of 14 in., and a maximum traverse stroke of 19 in.

The wheelslide carriage is attached to a hardened steel bar which is supported by and slides in pressure-lubricated cylindrical bearings mounted directly on the bed. Supporting the slide at the rear of the machine is a hardened and ground steel guide plate. Roller bearings are provided at this point between carriage and guide plate. A cylinder integral with the slide bar provides for hydraulic longitudinal traverse of the wheelslide.

A preloaded anti-friction cross slide is provided for the wheel spindle at the top of the wheelslide carriage. Both hand and power cross feed are provided and a hydraulic cylinder moves the wheelhead to the rear for plugging the hole when the wheelslide is moved to the extreme right. The cross feed is so arranged that the relation between the multiple diameters can be conveniently and accurately maintained by gage blocks. The wheel spindle bracket may be mounted in different positions on the cross slide for grinding large and small diameters inside or outside and also for face grinding.

The heavy-duty workhead is provided with a preloaded ball bearing spindle with a 9-in. hole through the spindle. A face plate or any other suitable fixture may be attached to the front of the spindle and provision is made for mounting faceplate jaws at the rear of the spindle.

Flexible Handles Speed Insertion on Elgin's Sapphire Gage Line

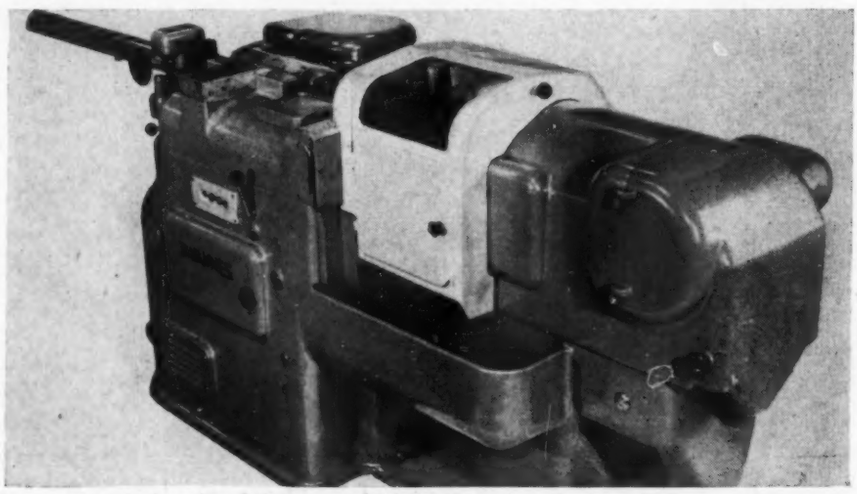
Flexible rubber handles have been added to plug gages by the Sapphire Products Division, Elgin National Watch Company, Aurora, Ill. The operator can approach the work within 20° of the hole axis and still obtain perfect alignment. The handle is lighter in weight than rigid ones previously used, increasing sensitivity of the gage. The flexible handle is said to result in faster operation with less fatigue for the operator and less abuse for the gage.

Positive identification of go and no-go ends of this sapphire flexible-handle gage is provided by round and hex nuts

Tavannes Single-Spindle Automatic Has 12 Individual Working Tools

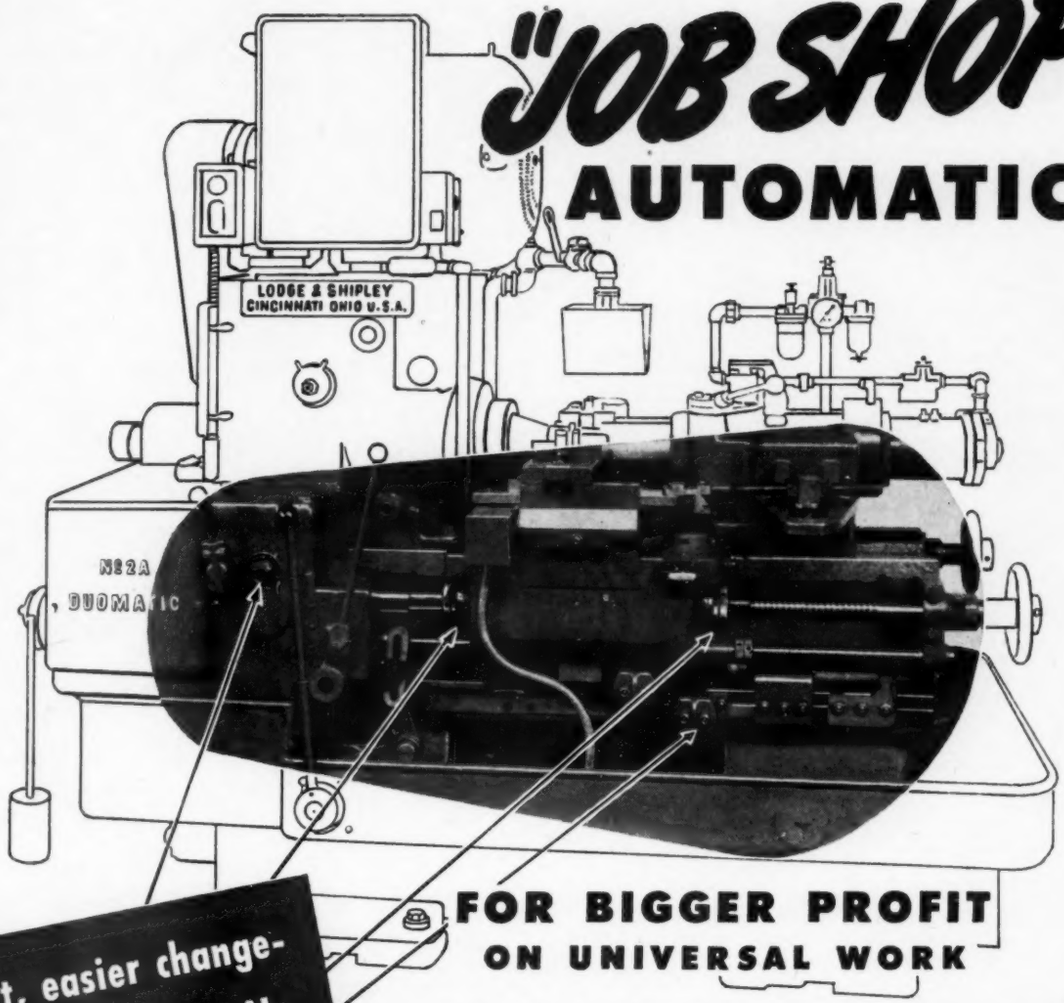
Independent control of twelve individual working tools permits carbide tooling to be used for all operations common to screw machines in the Tavannes automatic, marketed by Commentry Industries, Inc., 260 West Broadway, New York 13, New York.

Available working positions are divided into six stations for side slide operations, and six turret positions. Stock feeding is done by recoiling the headstock spindle back along the bar



The six-spindle turret is at the extreme right, the side slides behind the splash guard with the transparent windows, and the movable headstock is at left

"JOB SHOP" AUTOMATIC



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stock to the desired point of gripping. The stock is then fed forward through a revolving guide bushing, past the side slide tools and into the turret tools, as they are sequenced into working position. Feeding tension on the bar is maintained by servo-motor.

The guide bushing is located very close to the point of cutting action, so that unusually long work can be machined without the use of separate stock rests. Close size tolerances can also be held, as the work is supported at the point of maximum pressure.

The machines are built in two capacities: the M-40 which handles bars up to 1⅝-in. diameter, and the M-60 which handles bars up to 2⅜ in. Maximum turning length is 7⅛ in. with standard tooling, and 9 in. with a special tooling arrangement. The headstock unit can be recoiled twice, and use of turret unit or attachment replacing it restricted, to permit work up to 18-in. lengths to be effectively turned. Castings, forgings, or cut lengths of stock up to 4-in. dia. can be chucked.

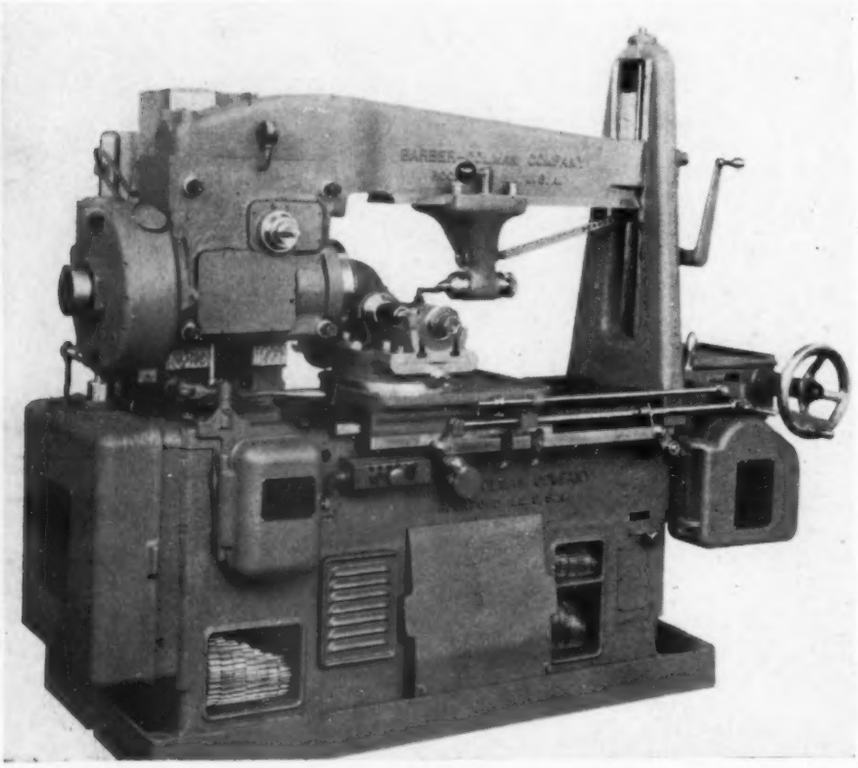
Heavier Construction Used in New Barber-Colman Co. Hobbing Machine

A number of changes have been made in the Type A hobbing machine built by Barber-Colman Co., Rockford, Ill. These changes are said to result in higher production at lower cost.

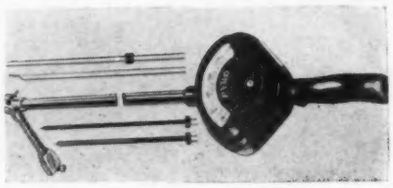
The machine now has heavy-duty work and hob slides, making it possible to operate with higher feeds and speeds. All drive shafts and gears are of heavy-duty design.

An improved method of mounting the index worm in the worm-gear case includes top and bottom ball bearings which rigidly support the worm independent of the main index drive shaft. This design permits the drive shaft to float, minimizing eccentricity in the worm, permitting the use of higher feeds and speeds.

The coolant pump has been simplified and is now driven by an independent motor. The volume of coolant delivered is increased, and coolant may be turned on or off as desired. A control panel has been added which centralizes all controls.



Barber-Colman's Type A hobbing machine has been equipped with heavy-duty work and hob slides, and other improvements, to permit the use of higher feeds and speeds on production jobs



This immersion pyrometer for non-ferrous use can be used with bare or protected thermocouples of various shapes

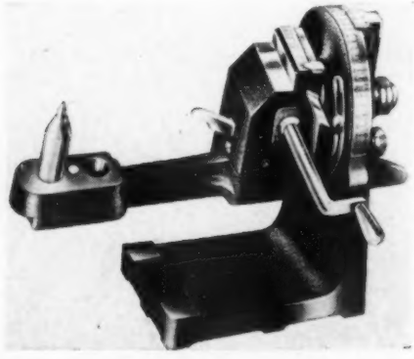
Non-Ferrous Immersion Pyrometer Works at Any Angle, Up to 2500 F.

An immersion pyrometer designed primarily for non-ferrous use has been announced by The Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y. The 4-in. direct-reading scale is calibrated from 0 to 1500 or 2500 F, or to an equivalent Centigrade range. Two models have over-all lengths of 27 and 43 in., with a swivel 8 in. from the connector block which permits use at any angle.

The thermo-electric system is constructed with a permanent-magnet, low-resistance galvanometer, has an internal automatic cold-end compensator in addition to an external adjusting screw. A shock-, moisture-, and dust-proofed steel case protects the thermo-electric system from demagnetization or magnetic interference.

Bley Contour Dresser Shapes Wheels Up to 14-in. Diameter

The Bley Contour Dresser is announced by Golconda Diamond Products Corp., 3414 N. Knox Ave., Chicago 41, Ill. This dresser is said to redress grinding wheels at a tolerance of less than 0.0005 in. It can be used to shape grinding wheels up to 14-in. diameter with 3-in. radii. The fixture is designed for all machines where a flat surface can be provided square to any radial line of the wheel. A range of 200° is available for angular work. Total travel for dressing angular surfaces 2 in. On tangent and radius combinations, a 1-in. straight travel on either side is available.



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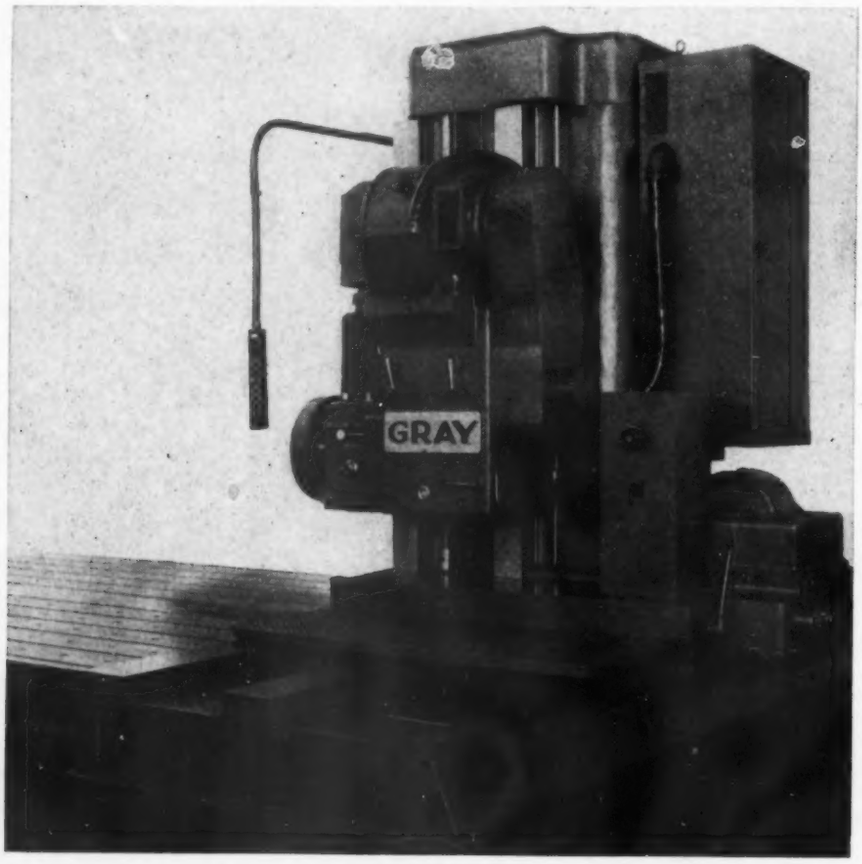
Gray Traveling-Head Milling Machine Is of Simple, Sturdy Construction

A traveling-head milling machine with horizontal spindle has been introduced by the G. A. Gray Co., Cincinnati, Ohio. The head is of extremely sturdy and simple construction. The spindle runs in double-opposed, preloaded, precision Timken bearings and is driven by a drive sleeve at a point close to the cutter, reducing the length of the spindle under torsion.

Powerful quick-acting mechanical clamps are provided for clamping the quill, head, and column. A positioning device readily sets the column and head within 0.00025 in. when a micro-jog button on the pendant switch is pressed. The pendant switch has seven pushbuttons. The operator can start or stop the spindle or jog it forward or reverse. He can also control the feed and rapid-traverse movements of the head and column from this switch.

Safety devices are provided to protect the machine and the work in the event of faulty operation. Overload protection for the spindle insures stoppage of the feed motor before the spindle motor stops.



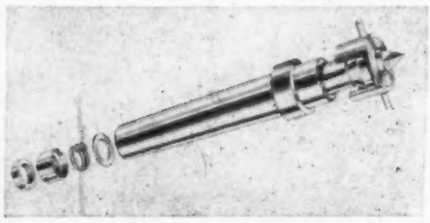
This Gray traveling-head milling machine is equipped with a floor plate and is driven by an adjustable-feed motor with electronic control. A potentiometer on the pendant switch controls the speed of the motor. The machine can also be furnished with the column fitted to a saddle having crossways perpendicular to the runway. The column may then be moved perpendicular to, as well as along the runway at the feed rate or by rapid traverse

Haskins Tapping Machines Have New Design, Sensitive Controls

A new line of "Electric-Air Controlled" tapping machines, the Type U, is being built by R. G. Haskins Co., 2760 W. Flournoy St., Chicago 12, Ill. The changes made include a new frame design, new principles in piston and air-cylinder construction, new air-operated table raising unit.

Increased sensitivity of control is said to have been built into the machine. Micro-switch actuated, 24-volt solenoid valves with sensitive pressure control offer automatic or controlled cycle of operation, as well as a means of synchronizing Electric-Air fixtures with the head stroke.

Greater accessibility for adjustment and replacement of control units is made possible by a hinged door the full length of the control chamber. Machines are available in three sizes, the No. 1-UT, with a rated capacity of No. 2 to 3/16-in. mild steel; No. 2-UT, with a capacity of No. 6 to 5/16-in. and No. 3-UT, with a capacity of No. 10 to ⅜-in. N. F.



Fish Has New Center Drive for Cylindrical Grinding Machines

A center drive adaptable to all types of cylindrical grinding machines is announced by J. R. Fish Research & Engineering Co., 1341 Main St., Agawam, Mass. Replacing the headstock center, this center drive eliminates the use of grinding dogs and permits grinding both ends of the work, or grinding one or more different diameters, contours, angles and radii in a single plunge operation. The manufacturer states that tolerances can be held to 0.00005 with practically no rejections.

McCROSKY *leads again* with these new *Multi-Duty Carbide Tipped* MILLING CUTTERS...

UNLIKE earlier carbide tipped cutters, designed and suited for use on one machine and one set of work conditions only, these new McCrosky Multi-Duty Cutters are general purpose tools. They can be used on job after job, and on one machine after another. The number of blades, and the rake and spiral at which the blades are mounted in the cutter bodies makes these tools ideally suited for a wide variety of medium duty work. Yet, the tools are amply proportioned and rugged enough for use on the new super-powered machines that have recently been developed.

McCrosky Multi-Duty Carbide Tipped Cutters are available in two styles,—one for milling cast iron and non-ferrous metals,—the other for steel. Both feature the Jack-Lock blade locking device—conceived and perfected by McCrosky engineers—that gives McCrosky inserted blade tools the rigidity of solid tools on the job,—yet permits quick release of the blades, and easy and accurate adjustment so that a minimum amount of blade stock is lost in regrinding.

BULLETIN No. 461

—gives full details—lists prices, etc., of the most popular sizes,—and formulas for determining safe operating factors when milling steel. Send for a copy today.

McCROSKY TOOL CORPORATION
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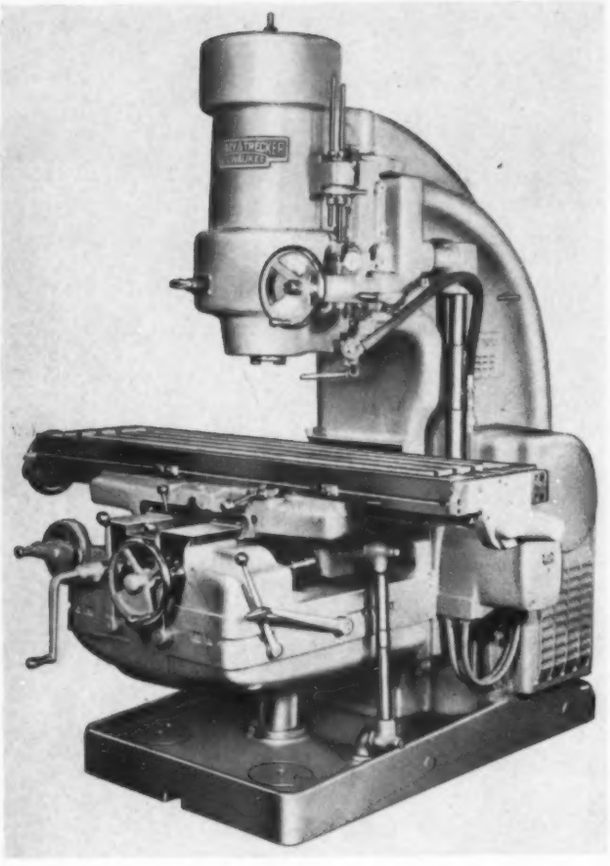
COST CUTTING TOOLS

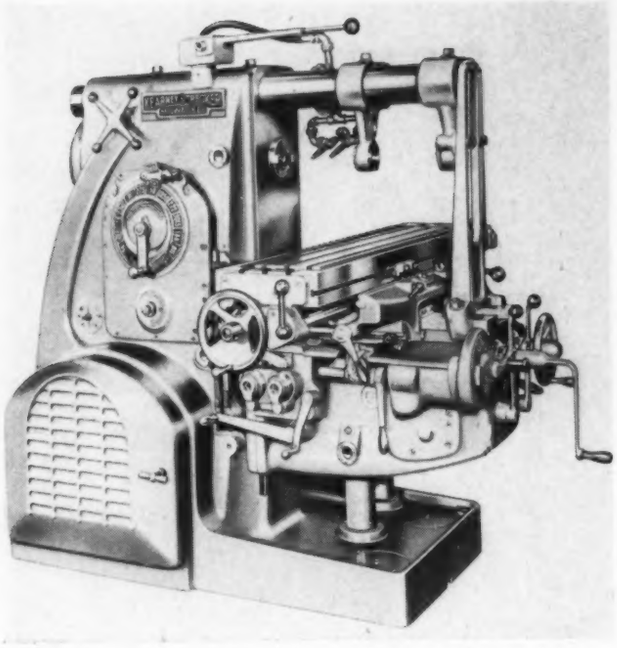
Designers and Manufacturers of

Jack-Lock Milling Cutters — *Super Adjustable* Reamers

Block Type Boring Bars — *Turret* Tool Posts

Wizard Quick-Change Chucks — *Special* Multiple Operation Tools





Available in horizontal and vertical models, the Kearney & Trecker CSM line of milling machines has a heavy flywheel splined to the spindle to provide uniform flow of power for milling with carbide cutters

Kearney & Trecker CSM Line Is Designed for Carbide Cutter Use

Kearney & Trecker Corp., Milwaukee, Wis., has developed the CSM line of knee-type milling machines. Horizontal and vertical models are available in 20-, 30-, and 50-hp. sizes.

These machines are the result of research in the application of carbides to a variety of milling problems. Analysis of these problems led to new and advanced cutter designs. Extensive experimentation in the use of these cutters on standard millers indicated the basic requirements of increased rigidity, greater horsepower, and a more uniform flow of power to the spindle. The CSM machines are said to be designed to fit these basic requirements for carbide milling.

The solid-back column has the spindle-drive motor cross-mounted in the base. Power is transmitted to the spindle through multiple V-belts and the spindle-speed selection box. Sixteen quick-change speeds from 50 to 1250 rpm. are in approximate geometrical progression. The spindle is provided with a center bearing spindle which is said to reduce deflection eight times. A heavy flywheel is splined to the spindle to assure a uniform flow of power to the cutter.

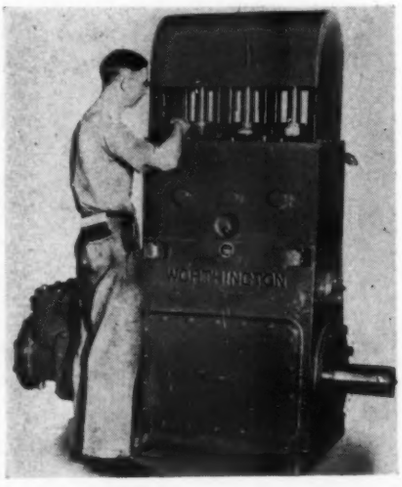
A feed and rapid-traverse drive motor mounted on the right side of the knee furnishes power to the table feed mechanism. Thirty-two quick-change feed rates from 3/8 to 90 in. per minute in approximate geometrical progression are provided. Climb-cutting equipment is provided for the table.

New Worthington Variflo Pump Has Stuffing Boxes Located Outboard

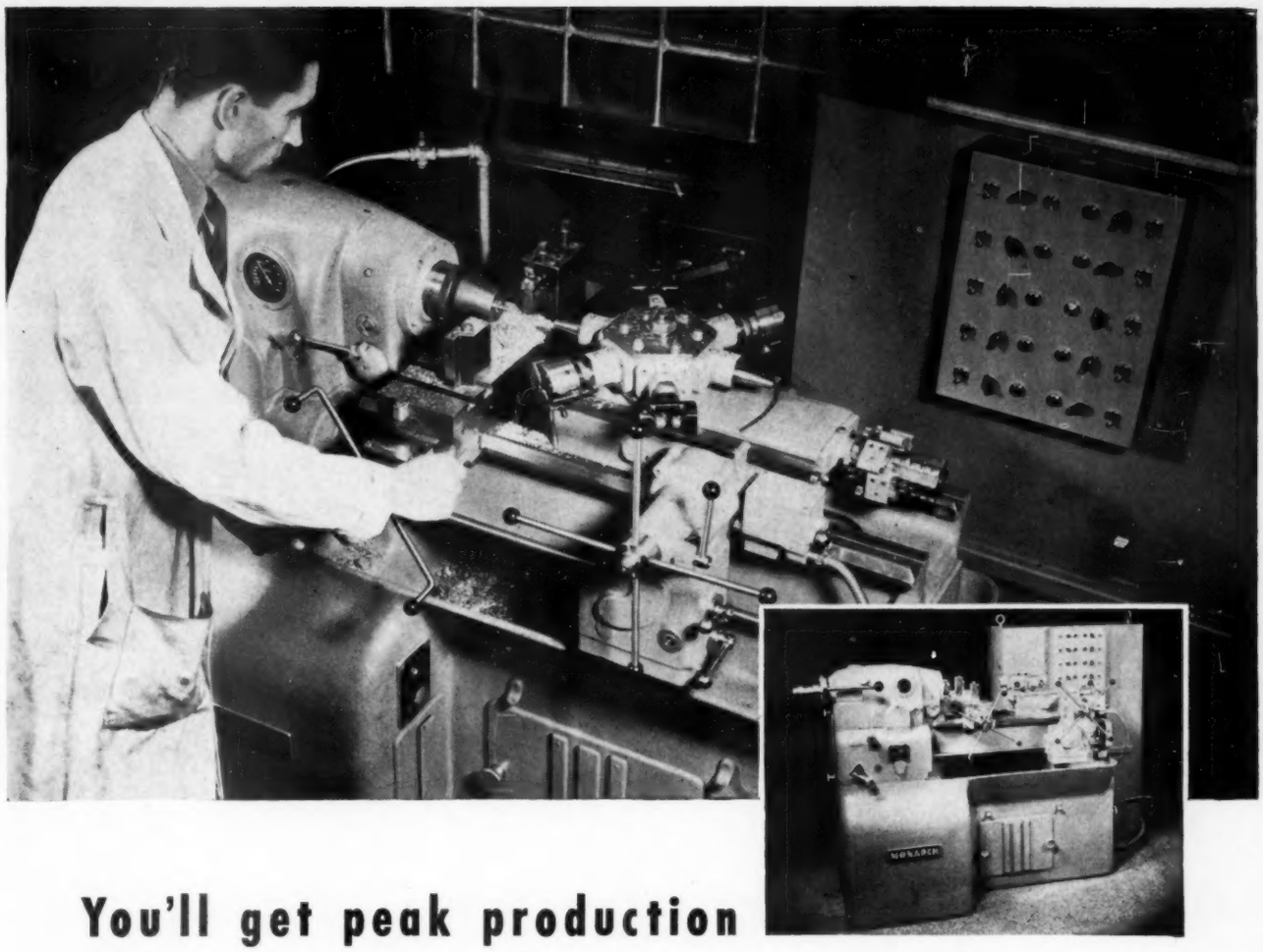
An improved variable-stroke triplex pump termed the Automatic Variflo is now in production by the Worthington Pump and Machinery Corp., Harrison, N. J. The pump has the stuffing boxes on top of the cylinder where they can be packed and adjusted without difficulty. In addition to the ease of access, this location is said to prevent stuffing-box leakage into the crankcase.

The crankshaft is located at the base, in the fully enclosed frame. Roller bearings are used. A direct-drive gear-type oil pump provides pressure lubrication as well as oil pressure to operate the hydraulic stroke control cylinder.

Stepless variation from 0 to 100% of capacity is possible through the control cylinder shown on the left of the pump. It functions on the principle of varying the position of the eccentric to suit the desired stroke or pumping capacity.



Suitable for product pipeline pumping, hydraulic extrusion presses, and other applications this Variflo has stepless variation from 0 to 100% of capacity



You'll get peak production AT A PROFIT—with the *Speed-Matic**

Automatic electronic speed change, preselected for as many as ten stations. Complete range of spindle speeds—50 to 5000 RPM. Feeds from .0005" to .016" per revolution. Collet chuck capacity 7/8".

You can define the Speed-Matic's specifications with those facts—but you can't describe its production capacity till you've seen it *in operation.* Finished parts roll off like peas shucked from a pod—and with unsurpassed accuracy. We think you'll call it *The World's Fastest Hand Screw Machine.*

With the Speed-Matic you'll get toolroom accuracy at production line speed. The skill you used to need in an operator has been built into the machine—to combine maximum high production with extreme accuracy, on lots of 25 to 500 or higher. Power feed ram type turret is teamed with a spring-return hand-operated cut-off slide.

* **SPEED-MATIC**—Add this new name to your metal-turning dictionary—you'll be hearing a lot of it—wherever rising production costs are a factor. The *Speed-Matic* is Monarch's answer to this problem in the hand screw machine field. For chucking and fixture work it's the *Uni-Matic:* for between-centers work it's the *Mona-Matic.*

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TURNING MACHINES

Landis Hydraulic Crank-Pin Grinder For Marine, Locomotive Crankshafts

Pins and main bearings of large marine and locomotive diesel-engine crankshafts can be ground accurately on a production basis on 40x216-in. Type B hydraulic crank-pin grinder built by Landis Tool Co., Waynesboro, Pa.

Basically the machine is like the Type B plain, but workheads and drive were designed especially for handling exceedingly large crankshafts. A dual work-drive arrangement eliminates or minimizes torsion deflection in the crankshaft. Power is transmitted from each work drive motor through a combination multiple V-belt and silent-chain reduction unit to a drive shaft extending along the entire front of the machine. Speed of the work drive motors is synchronized electrically and remains so by means of silent chains.

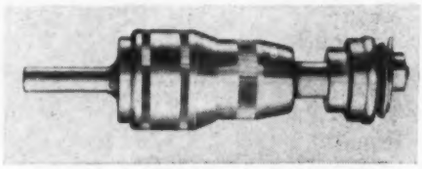
The massive workheads may be moved longitudinally on the work table to accommodate shafts of varying lengths. To balance the shaft, adjustable weights on the outer ends of the long workhead spindles are provided. Work-spindle bearings are automatically flood-lubricated, with a bull's-eye gage at the front of each head for checking the oil supply.

Throw blocks for crankshafts having varying end main-bearing diameters are interchangeable. The top half is of the floating type so it can be used for final clamping purposes. Fixture aligning latches are provided to hold the two work fixtures in alignment during loading and unloading. For grinding crankshaft cheeks, a shoulder grinding attachment is supplied. It is particularly rugged and is not intended merely for slight truing up of the cheeks. Control is by means of a handwheel to the right of the regular feed-up handwheel. Grinding may be done from either left to right or right to left, the amount of movement being ¼ in.

An electric control desk, usually located facing the front center of the machine, gives centralized electrical control. There are pushbuttons for starting and stopping the various electric motors and field rheostats for adjusting the speed of the work drive and traverse motors. Two ammeters enable the operator to accurately and quickly determine whether the crankshaft is perfectly balanced before he starts to grind. A second pushbutton grouping at the front of the wheel base may also be used.

Lincoln Electric Has Two Improved Stainless Steel Welding Electrodes

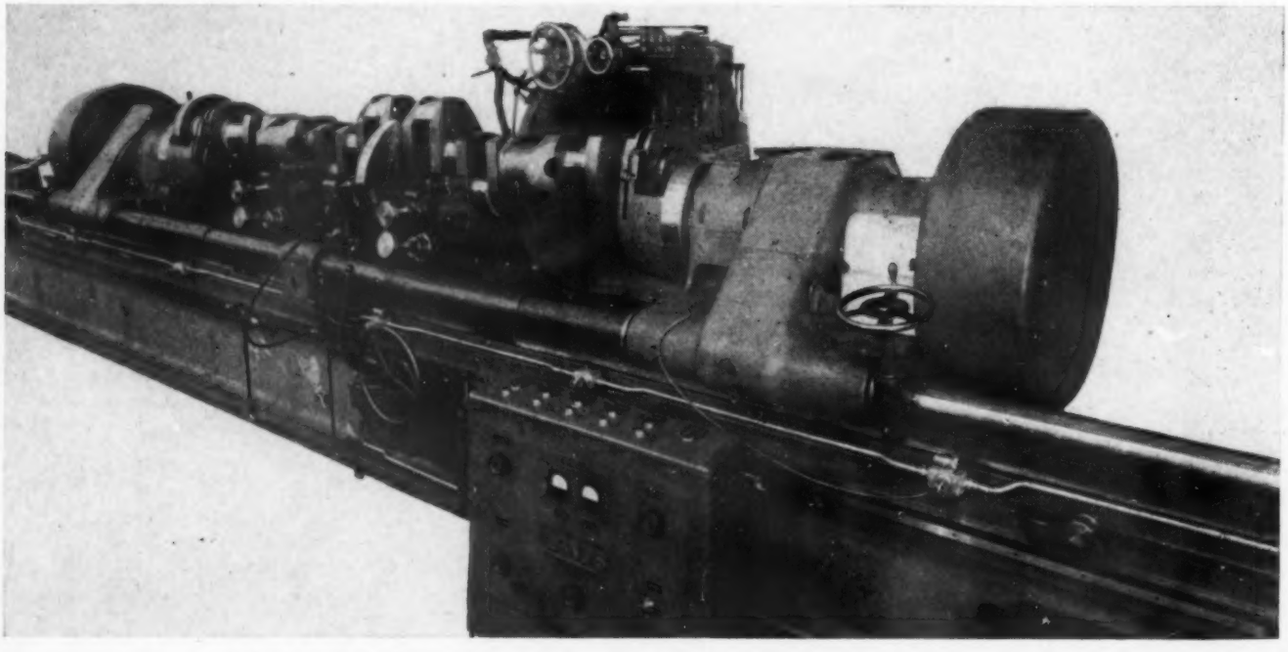
Two improved electrodes for shielded-arc welding of stainless steels are announced by The Lincoln Electric Co., Cleveland, Ohio. Stainweld A 7, discontinued during the war, is available in improved form for AISI 304 and 308 stainless steels. Stainweld A 7-Cb is columbium stabilized for use with stabilized 18-8 steels designated AISI 321 and 347.



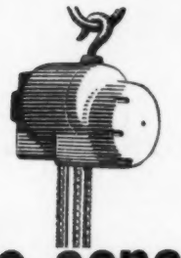
Lyon's Internal Grooving Tools Will Handle Wide Range of Sizes

A precision internal grooving tool which maintains tolerances to 0.001 in. is made by Lyon Machine Co., Worcester, Mass. The tool is operated on a cam principle which guides the cutter into the bore by a bushing made to the size required for the housing. As the tool enters the work, the cutter is in neutral position. As the tool is further depressed, cam action extends the cutter, cutting the required groove. Depth of cut is regulated by an adjusting screw. Location of the groove in the hole is regulated by the up and down motion of the gagehead.

The tool comes in three models. Model A is for bore diameters from ⅛ to 1⅜ in., with a maximum depth of groove of 0.273 in. Model B is for diameters from 1 7/16 to 2⅜ in., with maximum depth of groove of 0.247 in. Model C is for diameters from 2 7/16 to 4 in., with a maximum depth of groove of 0.325 in.



A dual work-drive arrangement minimizes torsional deflection in the large diesel-engine crankshafts ground in this Landis 40x216-in. grinder



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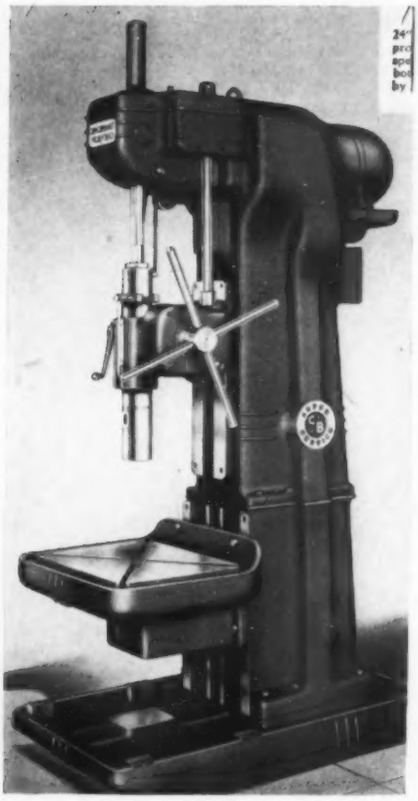
Cincinnati Bickford Upright Drills Suit Medium and Large Drillheads



The 24-in. Super Service direct drive drill is designed for either small lot or mass production operations

A new line of upright drilling machines is announced by the Cincinnati Bickford Tool Co., Cincinnati, Ohio. These machines are built in 21-, 24-, and 28-in. sizes and have driving motors from 3 to 10 hp. Standard motor speed is 1200 rpm., although 900- or 1800-rpm. motors can be obtained if lower or higher spindle speeds are required.

Rearranging the change gears gives 16 speeds and 8 feeds. Adjustable automatic tapping reverse arrangement is available for production tapping. Tap leads, when supplied, are of the gear drive type. A direct-reading graduated scale facilitates drilling to the exact depth within 0.005 in. When extreme precision to within 0.001 in. is required in facing operations, a special dwell attachment can be supplied.

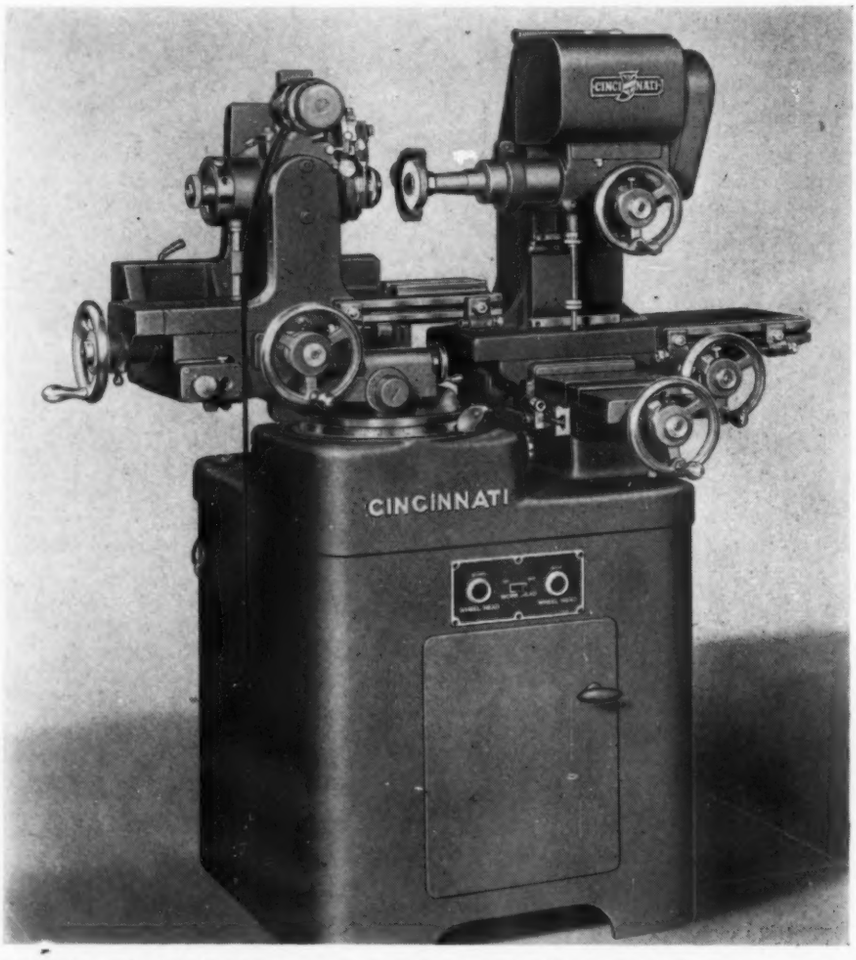
The chrome-nickel steel, multiple-splined spindle is mounted on precision anti-friction thrust radial bearings. Spindle and sleeve are counterbalanced for easy operation by an easily accessible weight inside the column. Standard counterweights are in one piece. When drillheads are used, removable section weights are furnished to facilitate balancing the various drill heads. These machines are well adapted for medium and large size drillheads because of this provision for balancing, the rigid support provided by the flanged drill spindle, and the fact that ample power is available.

Cincinnati Cutter and Tool Grinder Built for Fast, Accurate Operation

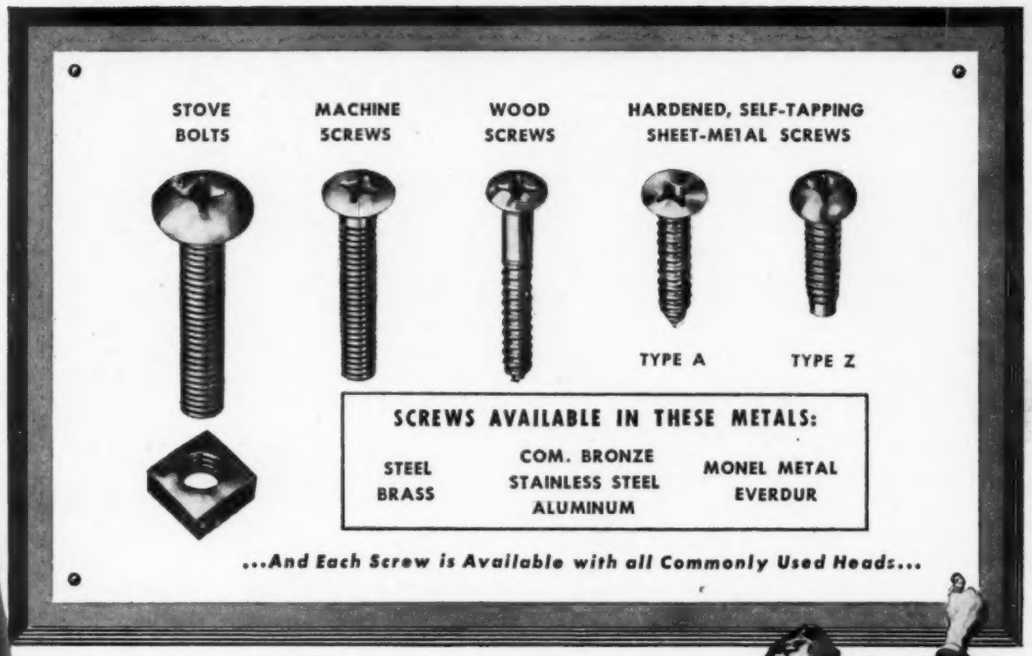
Cutter shapes involving convex or concave radii, with straight, tapered, or helical teeth, can be resharpened or ground from the solid without the use of special attachments on the Monoset cutter and tool grinder just introduced by Cincinnati Milling Machine Company, Cincinnati 9, Ohio. Although the basic principles of operation of the previous machine have been retained, the Monoset has been completely redesigned. Conventional resharpening can be done, but machine is said to be especially useful for "problem" cutters or special-sized drills.

Most jobs can be performed with a single chucking. The workhead unit is mounted on a turntable base. The workhead may be swiveled through 235° with adjustable stops accurately to limit its arc of travel. A transverse slide provides for the grinding of radii which have their centers offset from the centerline of the workpiece.

A built-in spiral lead mechanism provides a means of generating right- or left-hand spirals with leads as



Flexibility is built into this Monoset cutter and tool grinder which makes it possible to perform most jobs with a single chucking



You can get the SPECIAL SAVINGS of AMERICAN PHILLIPS SCREWS in any type...with any head...in any metal

No other screw-driving method can give you the time-savings of American Phillips Screws—*as much as 50% under your present assembly time.* American Phillips Screws give you the self-aligned fit between screw and bit . . . the fumble-proof ease of driving . . . the slash-proof protection for work surfaces . . . and the value-protection for *you* that comes from American's quality-control and 4-phase inspection, assuring higher perfection-percentage in every order marked "*American brand.*"

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short as 1-13/16 in. A single graduated-dial adjustment is used to select the lead desired.

The workhead spindle has a collet chuck with 13 straight collets ranging from ⅛ to 1¼ in. diameter and 6 taper collets. An adjustable tail-center support is provided for centered work and adjustable, spring-tensioned supports for uncentered work.

Two indexing systems are used: first, a simplified ratchet-type device for jobs not involving spiral leads; second, a spring-pressed pawl-type mechanism with interchangeable index plates for spiral-fluted cutters.

Workhead-spindle motor drive is supplied for cylindrical grinding. The grinding-wheel spindle is supported by three sliding elements which permit longitudinal, transverse, and vertical movement of the grinding wheel. The handwheel control for each slide has a micrometer dial. Each slide has an adjustable micrometer-type stop dog to limit slide movements.

Clearance angle scales are provided on the vertical and transverse slides to simplify the grinding of tooth clearance angles. The grinding-wheel spindle has a two-speed drive to help maintain correct cutting speeds. Lubrication of all sliding elements is obtained by a pair of "one-shot" lubricating systems.

A high-speed spindle attachment for small mounted wheels gives a means for accurate internal grinding operations. This attachment is also useful for jobs which require the use of small-diameter wheels in conjunction with the workhead swivel or spiral-lead generating mechanism.

Springfield Has Versatile Hydraulic Profiling and Duplicating Machine

A hydraulic profiling and duplicating machine, announced by the Springfield Machine Tool Co., Springfield, Ohio, is said to duplicate any job from bottle molds to complicated cam forms, either interior or exterior. It is illustrated as an integral part of a Springfield 20-in. lathe, but other sizes are available.

Any type of templet may be used—a round type rotated between centers at the rear of the machine, a flat one held stationary between centers, or a formed flat one mounted directly on one of the brackets. Two brackets are standard equipment and these are adjustable on machined and hand scraped ways on the rear of the bed. Templets requiring rotation are driven by an adjustable chain drive directly off the spindle. The drive mechanism is amply guarded with a metal guard.

Twelve spindle speeds are obtained by three levers on the front of the headstock. These speeds are further reduced, when required, by means of two-speed motor.

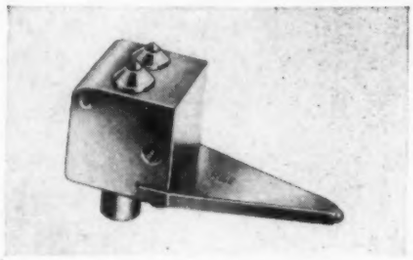
Most of the duplicating mechanism is carried on the cross slide which is designed to overhang the rear of the bed enough to mount the stylus control valve on top of the slide. This valve swivels to accommodate various contours. On the under side is the master hydraulic cylinder, controlled by the stylus, for duplicating work running parallel to the machine spindle. Another master cylinder, attached to the cross slide inside the machine ways, is furnished for duplicating work at right angles to the spindle.

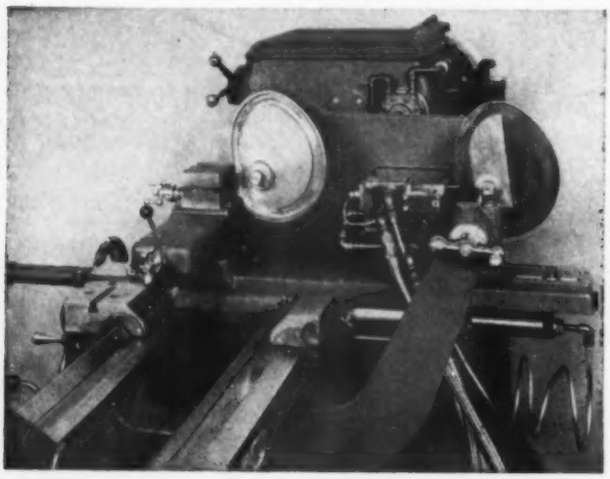
The hydraulic pump unit, including oil tank, motor, pump, relief valve, and pressure gage, is separate and may be located in any convenient position. Flexible pressure hose connects pump with master cylinder and control valve stylus.

The operator has a clear view of the cutting tool while the operation is in progress. The profiling arrangement can be easily disengaged and the machine used for regular lathe work.

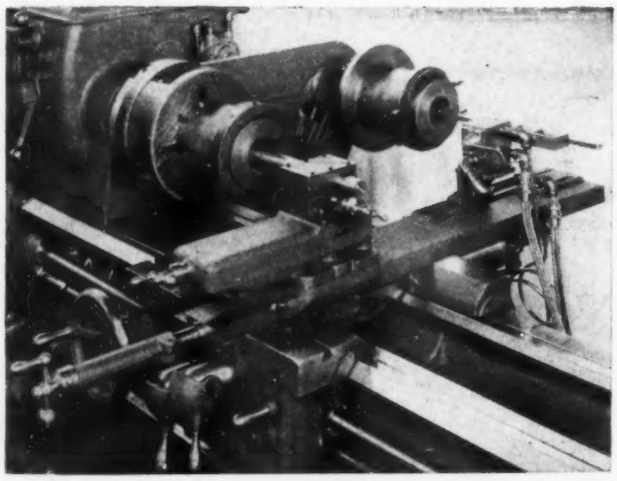
Fish Double Diamond Tool Dresses Wheel to Cut Two-Diameter Shaft

Designed to form the necessary grooves and step in grinding wheels to permit the entire surface of a two-diameter shaft to be ground in one operation, a new diamond-wheel tool is offered by J. R. Fish Research & Engineering Co., 1341 Main St., Agawam, Mass. The double diamond tool is inserted between centers to dress the wheel in actual working position, producing the step necessary for grinding two shaft diameters. This is said to eliminate errors caused by moving the carriage in the customary way.





Here the attachment is arranged for contour-cam turning with a thin sheet-metal pattern revolving to serve as templet



A bottle mold is duplicated from the original mold by horizontal movement in this Springfield hydraulic profiler

1. Flashlight clip
2. Refrigerator door catch
3. Fuse clip
4. Switch contact
5. Condenser member
6. Tension spring
7. Contact blade
8. Sliding contact
9. Guide fork spring
10. Switch tension spring
11. Spring pressure plate
12. 3-way plug contact
13. Tin-coated bellows
14. Flexible hose

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Strength — Resilience — Fatigue Resistance — Corrosion Resistance — Low Coefficient of Friction — Easy Workability — are outstanding advantages of Revere Phosphor Bronzes, now available in several different alloys.

In many cases it is the ability of Phosphor Bronze to resist repeated reversal of stress that is its most valuable property. Hence its wide employment for springs, diaphragms, bellows and similar parts. In addition its corrosion resistance in combination with high tensile properties render it invaluable in chemical, sewage disposal, refrigeration, mining and similar applications. In the form of welding rod, Phosphor Bronze has many advantages in the welding of copper, brass, steel, iron and the repair of worn or broken machine parts. Revere suggests you investigate the advantages of Revere Phosphor Bronzes in your plant or product.

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Parts and Materials

Firth-Sterling's Cromovan Steel Developed for Large-Output Dies

A production die steel said to be suitable for production runs of unusual size is announced by Firth-Sterling Steel Co., McKeesport, Pa. Designated Cromovan, this steel is intended for cutting and forming dies and for some types of punches, rolls, gages, taps, reamers, lathe centers, and spinning tools. Cromovan is said to have minimum dimensional change during hardening, hardness of unusual depth from air cooling or oil quenching, and good machinability.

Snyder Sales Has High-Pressure Coupling that Rotates 360 Deg.

The All-Flex ball-bearing swivel pipe coupling is offered by The Snyder Sales Corporation, 5225 Wilshire Blvd, Los Angeles 36, Calif. This coupling is designed to convey fluids under high pressure through a pipe which rotates a full 360°. The coupling is said to be proof against leakage at high and low pressures and to rotate freely at all pressures.

Anker-Holth Air and Hydraulic Cylinders Eliminate Tie Rods

Anker-Holth Manufacturing Co., Port Huron, Mich., has developed a series of non-rotating linear actuating cylinders. These cylinders, designed for pushing, pulling, lifting or lowering operations, are of the dual-action type with tie rods eliminated. Either end of the cylinder is quickly and easily removable. Cylinder walls are 9/16 in. thick. The range of cylinder bores—from 3 to 14 in.—with seven different mountings available — are manufactured in air or hydraulically operated models.

Other Anker-Holth developments include Air-Grip chucks in 21 and 3-jaw types as well as adjustable and compensating jaw models, rotating cylinders, air-operated collets, bar-stock collets and cylinders, arbors, mandrels, drill press chucks; lubricating assemblies, mill type cylinders, air pressure regulating valves, 3- or 4-way air valves, hand or foot operated; and hydraulic power units.

Rheem Makes Corrosion-Resistant Coating for Zinc, Cadmium Parts

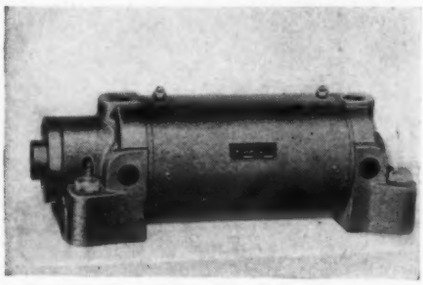
A chemical treatment that produces a bright, transparent, chromate film on zinc- or cadmium-plated parts has been added to the line of Iridite finishes manufactured by Rheem Research Products, Inc., 1409 Standard Oil Bldg., Baltimore 2, Md. Known as Iridite Bright, the process forms a new corrosion-resistant finish on the metal which is said to reduce finger-marking and not to fade or tarnish.

Parts are immersed in the Iridite Bright solution for 5 sec., followed by rinsing and drying. A low-concentration caustic rinse may be used to give a more brilliant finish. Test panels showed no signs of white corrosion after 100 hr. exposure to salt spray under Bureau of Standards Specifications.

Tests conducted by Rheem are said to show that Iridite Bright offers no resistance to soldering when applied over cadmium plate.

Logansport Rotocast Cylinders Have Centrifugally Cast Barrels

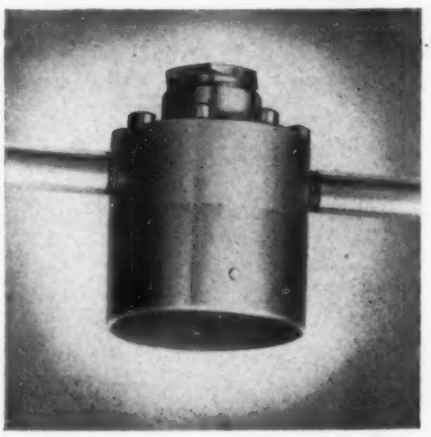
Maximum power without leakage and accuracy of bore dimensions are claimed to result from the centrifugally-cast barrels of the Rotocast hydraulic cylinders, manufactured by Logansport Machine Co., Logansport, Ind. It has O ring seals and automotive-type piston rings. No tie rods or gaskets are used. Built for operating pressures to 1500 psi., cylinders are adapted for operations involving pushing, clamping, lifting, and other power movements in any direction.



Made in seven mounting types, three piston-rod models, and nine standard bores, they are available with cushioning at one or both ends. Designed for oil, the cylinders may be used for water service if water is treated; if untreated, units of special material can be supplied.

Grove Pressure Regulator For Initial Pressures to 3400 lb.

A small pressure regulator manufactured by Grove Regulator Co., 6593 65 St., Oakland 8, Calif., weighs 2 lb. and measures 2¾ x 3¼ in. It is suitable for handling initial pressures up to 3400 lb., with adjustable control range from 5 to 1500 lb. Models can be supplied for higher initial pressures up to 5000 lb. Although designed for air and gases, the unit can be furnished for liquid service. Has stainless steel ports and homogenous structure of duraluminum. Valve and seat construction is engineered for positive dead-end shut-off and regulator is instantaneous in operation. Available for ⅛- and ¼-in. pipe sizes.



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APT PARTS

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October 1, 1945

Mr. C. J. Linxweiler, Mgr.
Machine Tool Distribution
The Sheffield Corp.
Dayton 1, Ohio

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ROUND TABLE DISCUSSION

PROFIT TAKER OR PROFIT MAKER?

From my contacts with various plant owners, engineers, foremen, and machinists, plus my own experience, I have found that well-equipped shops are so equipped because they increase profit percentages. There are few, if any, owners equipping their establishments with modern appointments just because they can afford to, or just for the sake of spending money.

I have observed shops using both old and new equipment in the experimental laboratory, the toolroom, the job shop, and the production line. In every case the purchase of new, more rugged, more efficient, more versatile, more precise, and faster machinery has more than paid for itself despite the fact it cost more originally and superseded machinery that was comparatively new and in good condition. Older machinery, regardless of its condition, can never compete with new and faster units. The extra labor charge plus overhead will knock down production, hence profits.

Larger companies have been aware of this for a long time. Thus organizations engaged in mass production, such as major automobile and electrical-supply corporations, almost without exception constantly renew their machinery. They realize that even a few seconds saved on each operation or each piece mounts up to many thousands of dollars.

Very well. Let us now look at the medium and small companies specializing in mass production. It is true that on shorter runs, a wide variety of work tends to cut the savings on each individual run, yet even in the field of short runs, the savings realized on labor, overhead, and various other factors, are considerably more than can be realized with older machinery. In the future, competition will be keener than it has ever been, with speed as well as precision the keynote. The companies with well-equipped shops will get most of the work because they can deliver the goods faster, better, and cheaper than those companies with older machinery.

The owner of a small screw-machine plant told me that, as a result of having a well-equipped, up-to-the-minute shop, he can compete favorably with larger companies and has a distinct advantage over companies

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Among the features indicated below are many of the reasons for the high overall mechanical efficiency and the high volumetric efficiency of Vickers Variable Delivery Piston Type Pumps. Also, the inertia forces of the rotating parts are minimized . . . the cylinders are arranged axially permitting more compact design.

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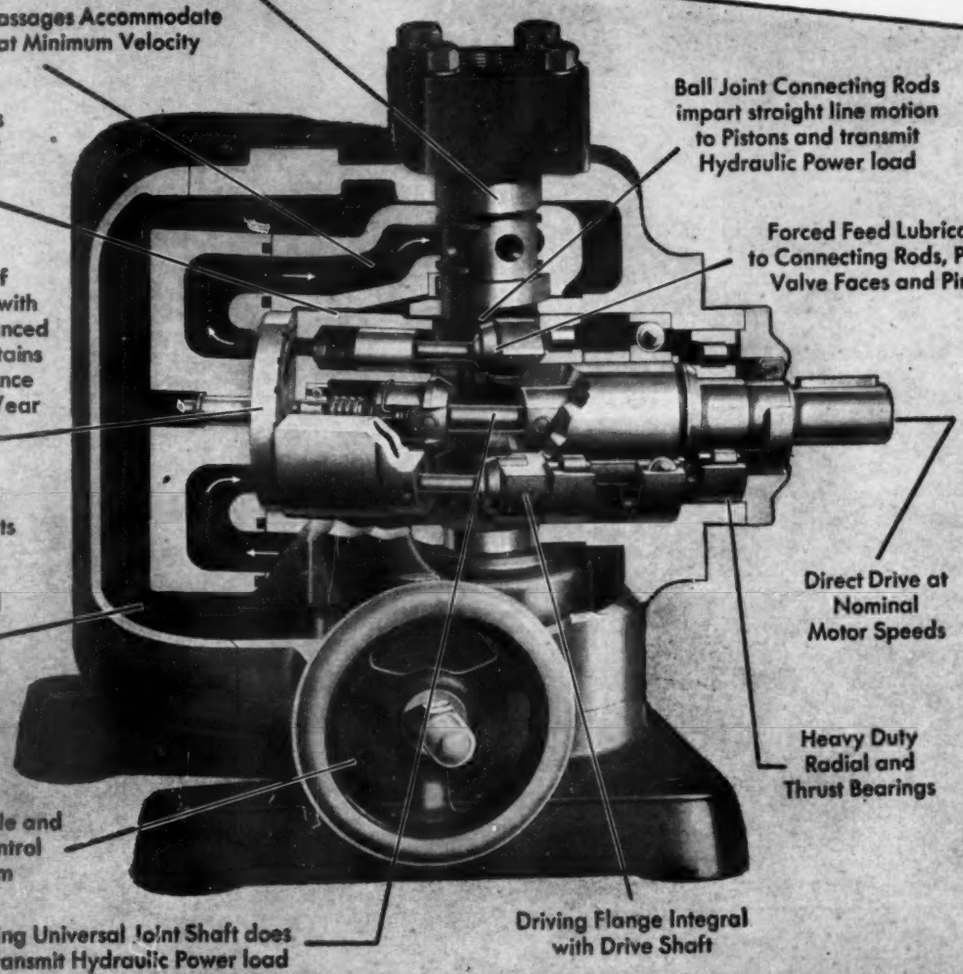
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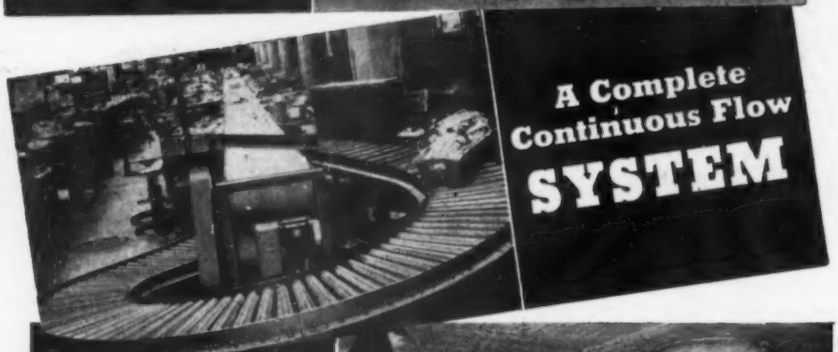

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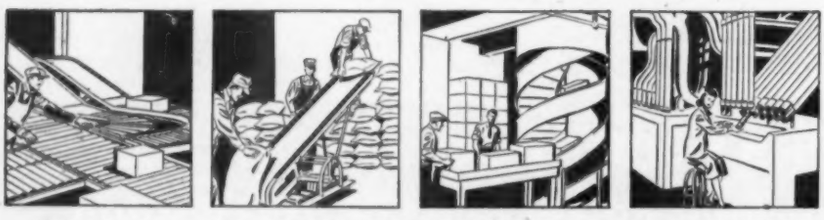

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the same size as his, using older equipment. True, in some cases the older equipment will do the job with about the same degree of precision as new machinery, but it cannot produce the work as quickly or as cheaply.

In toolrooms and laboratories, screw machines and other mass-production machines are not to be found. General-purpose and universal-type machines are the equipment, and profits are realized in another manner. In the toolroom, profits are realized on the products the tools are being used on rather than on the tool itself. Many toolrooms are equipped with comparatively old machinery because the owner feels any loss incurred in production with the tool will be offset by the profit on the product the tool is being used upon.

Not so! The progressive toolroom equipped with new machinery realizes that the essence of speed does not save very much on the tool but it gets the tool to the production or assembly line faster. Here the real saving is accomplished. The longer the production unit is non-operating while waiting for tools, the more production is lost, the more overhead rolls up, and the more time advantage is lost. Several companies have lost orders they could normally execute, because they could not tool up fast enough. Why couldn't they tool up fast enough? Because their toolroom machinery was not accurate enough or versatile enough to produce the complicated tools required. True, old machinery can be accurate, but if speeded up to meet modern demands it soon becomes worn, inaccurate and useless.

In the experimental laboratory, I think new machines are a must. Why?

First: The new equipment does the job quicker and cheaper, thus instead of spending most of the appropriation on labor involved in building the project, the savings affected by the faster machinery may be diverted to the engineering and designing of the project.

Second: New and improved machinery in many cases does work with a higher degree of precision then is possible with older equipment. Many an experiment has been a failure, not because the theory was in error, but rather because the equipment used to build the original model was incapable of giving the desired accuracy. I will admit that new machinery is inaccurate if it is abused, but this is yet another subject.

Third: In laboratory work particularly, a host of different setups are required in the course of building an experimental model. New and well-equipped shops are a must for the

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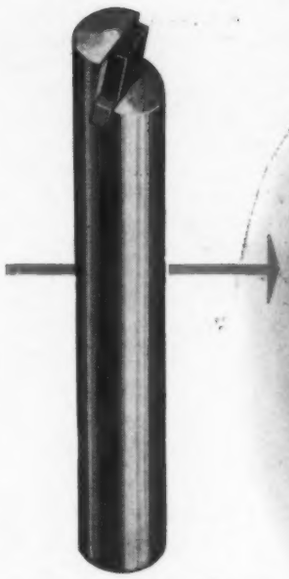

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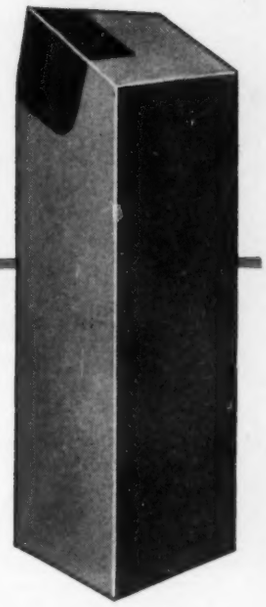

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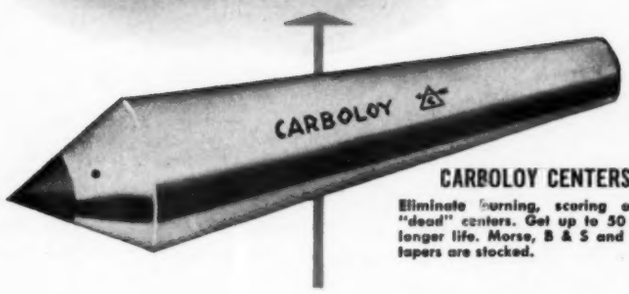

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For maximum savings from carbide tool use, don't overlook these "special-purpose" standards. They're designed to give you the same top-quality results at the same low cost as Carboloy's well known standards for general purpose turning, facing, boring.

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RYERSON STEEL

very fact they are so versatile. Their versatility often eliminates the necessity of purchasing additional equipment to accomplish a given job.

In the field of research several companies are often racing toward the same goal at the same time. The company that completes its research quickest and is able to get its product to the market first, is the company that makes the money and gets the edge on its competitor. New and well-equipped machines in the laboratory and the toolroom are definitely a deciding factor in this situation.

In the above few paragraphs, I have assumed that well-equipped shops are the best. I have attempted to show how and why they are best, thus explaining why shop owners purchase new and complete equipment even though existing equipment is still serviceable. *Owners equip their shops with modern machinery and complete equipment because the modern well-equipped shop increases profit percentages.*

William B. Harnden,
Dorchester, Mass.

•

SHOULD MACHINISTS BE LICENSED?

My answer to this question is a definite "Yes!" Take, for example, an apprentice machinist of some five years of experience. If at the end of this time he had to apply for a license, his value could be better recognized by obtaining the license than by merely showing a union card.

From my own 46 years of experience in more than 125 shops, I make no bones about saying that I don't trust union standards for a man's knowledge. A man with an impressive tool box is nice to meet, but the tool box doesn't attest to whether or not he has had real experience in using the tools. There is so much bluffing going on these days that a sensible licensing program might save a lot of employers the wasted time of hiring a man and then firing him because he couldn't produce.

My grandfather used to say that he would send a prospective employee through a door. If the man shut the door behind him, he was hired. If he left the door open, my grandfather let him keep right on walking. It's the same with the chap owning a nice tool box. He gets my respect if he can use the tools.

As far as tools go, I've seen many a character who has come by his tools at the expense of others. It amounts to plain thievery. I've been cheated and fooled some too, but the thing that irks me more than anything else

STAINLESS STEEL . . . TOOL LIFE *Up 400%*

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Increases Production from 75 to 380 Pieces per Grind

A manufacturer of automotive parts formerly obtained from 20 to 75 pieces between tool grinds, and was troubled with high drill-breakage.

Changing to Sunicut, for a cutting lubricant, he was able to increase tool life more than four hundred per cent — to 380 pieces per grind. Finish was improved. Here are the facts:

Machine . . . Brown & Sharpe 2-G Automatic	**Operations . . . Drilling, reaming, forming, and cutting off**
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Sunicut is a clear, free-flowing, sulphurized oil produced by an exclusive Sun process. It has high lubricating qualities, is an excellent dispenser of heat. Call the Sun Cutting Oil Engineer near you for full details.

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PRODUCTION DATA REPORT

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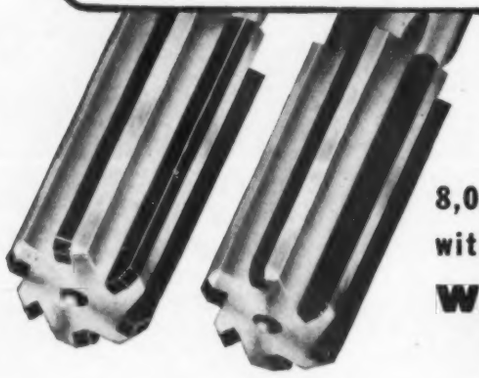
Address:	Milwaukee, Wisconsin
Tool:	Wendt-Sonis Carbide Reamer. Carbide full length of flute.
Job:	Reaming Pulley Wheel Hole. S.A.E. 6150 steel. Super finish required.
Speed:	935 RPM.
Feed:	.006" feed per revolution.
Results:	Averaged 8000 holes per grind — holds size — super finish.



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THESE new type reamers are designed to reduce rejects, speed up production and save on tool costs. Their *full length carbide flutes:* (1) eliminate "wobbling" commonly caused by wear on steel flutes, (2) possess greater resistance to wear than flutes with carbide tips only. Maximum flute bearing surface in bushing assures perfect hole alignment and long service life. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI, PACIFIC DIVISION: 580 NORTH PRAIRIE AVE., HAWTHORNE, CALIFORNIA.

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is the bragging union worker who sports a lot of fancy tools but would rather call a wildcat strike than use them. He's on a par with the guy who sneaks good tools from the boxes of other men. If a man can't qualify for a license, he's not going to need the tools from somebody else's box. It would be interesting to see the affects of a licensing program.

I have read *American Machinist* for 45 years and I always enjoy reading it. I hope my views will interest others reading the discussion column.

Julius N. Dunneback
Mineapolis, Minn.

•

Should machinists be licensed? In practice, yes; politically, no. We have always had the men who read a book, or walk under a machine shop sign, and call themselves machinists.

After the last war it took about 6 months to a year to run the operators out of the first-class machinist jobs. I know of several good machinists who quit the trade after the last war and started driving delivery trucks. They made more money bacause they worked on a commission, and if they worked, they made extra money. They did not have this chance in the shop; they watched men in the shop make the same money as they did on production work. They had served from 4 to 6 years apprenticeships; they were for the most part first-class machinists who could make almost anything on any machine from a sketch, a blueprint, or sample. The would-be machinists were only capable of running one or two machines on jobs that were partially or fully set up by the older men. Management could have corrected this.

I have believed for quite a few years that many of our labor troubles have been caused by poor management, from top management down through the foreman. There are several things that could be done to correct the present medley where no one knows who is capable and who is not.

In the first place we should recognize ability and have foremen who are trained to advance men in the trade, not hold them down for petty selfish reasons. I have known foremen who turned down hundreds of good ideas because they were afraid of their jobs. The only way the machinist can advance under a foreman of this type is to quit his job and move on. They would have to take the chance that they might find someone who would let them use their talents to full capacity.

Our schools have been turning out yes men for years, and the armed services have not helped. Foremen

IT CAN REACH MANY SURFACES

THE Hand Cut Cone Shape is one of the most popular in the line of Nicholson Rotary Files—largely because of its versatility. Its straight-sloped side can be used for cleaning flat, concave and even convex surfaces. It can get into narrow rounded corners; can be used for burring and enlarging holes; reduces the number of tool changes when working on irregular parts.

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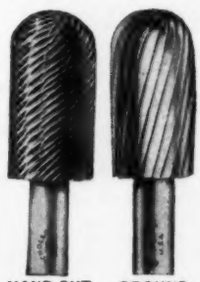

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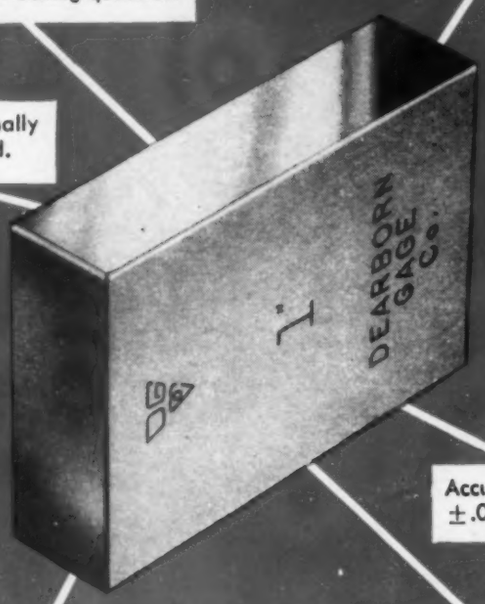

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Originators of Chromium Plated Gage Blocks

This Ellstrom tool makers set with chromium plated gaging surfaces contains 6 blocks in .0625, .125, .250, .375, .500 and 1" sizes available in standard accuracies. Prices sent on request.

and supervisors soon learn that they get along better if they tell their superiors the things they want to hear rather than the things they should know. This leads to leadership going away from management rather than to it. We used to look to our foremen for advice and leadership; now the boys look to someone outside the institution, who at least give them attention.

We have one union shop here which demands that top rates be paid to men who have completed a specific number of hours on a machine and can pass a written test on the related subjects needed for each machine. When they have completed their time and passed the test, they receive top rates and not until then.

If management will put in men as foremen, inspectors, personnel men, and other key posts who are picked because they know the trade, and who have been given special training in their special work, they will soon be graded as: machinist 1st class, tool makers, operators 1st class (can set up), operators 2nd class (who can make minor adjustment), and operators 3rd class (runners only).

I have never come across a personnel man who could watch a man grind a lathe tool and tell if he was a first-class lathe man, or open up a man's tool box and ask him to make a check with his tools on a piece of work, or check him on reading blueprints. Management picks a man for this job that is long on paper work and short on practical experience. They also load them down with so many details they don't have time to do the work of picking the right man for the right job.

You will notice that I have placed the first-class machinist ahead of the tool and die maker. I could be hung for this; but when the trade was under a form of apprenticeship, we had to learn all types of machine work. After all, the tool makers are a specialized part of the machinist trade as a whole. The first-class machinist can make tools, and if he likes close work, he will be able to do tool and die work through practice which is the only way anyone can be efficient in any field.

There is another machine shop here which hired all men through our school. If a man claimed he was a lathe hand, assembler, or a first-class machinist, and was not a local man whose work could be traced, he was sent over to school for a test as to his capacity. About 75% told us they were running a bluff when they were given a blueprint and told to

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PROGRESSIVE *Kearney & Trecker Corp.*, Milwaukee, Wisc., reports the following savings by TOCCO hardening the above saddle clamp eccentric of their Milwaukee Milling Machine:

	FORMER METHOD	TOCCO
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Total Cost	$ 1.573	$ 0.099

Saving . . . $1.47 per piece

In addition to this saving of $1.47 per piece, TOCCO made possible a switch from alloy steel to S.A.E. 1045 steel, saving $0.110 in material cost per piece.

Total saving on each run of 1375 pieces for this one part is $2,172.50.

Kearney & Trecker hardens a total of 140 different parts on one "TOCCO JR." machine. Output of some parts has been increased as much as 500%.

Why not enlist TOCCO's experienced Engineers to help you obtain similar improvements for *your* production? New booklet, "Results with TOCCO", gives ideas for hardening, brazing, annealing, heating by TOCCO Induction.

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grind the tools required to do the job.

Take the case of the Jap who came to me one day with a letter of reference from a prominent resident of Kalamazoo, for whom he was a house boy and chauffeur. He told me he wanted to learn Machine Shop, and he wanted me to recommend him for a job in Detroit upon the completion of his training.

The first tool he ground was so bad it put me on my guard. I watched him. The tool he ground to do his lathe work showed the quality we look for in good tools: clean grinds, no chatter marks, and correct angles. He could put the tool back on the wheel at the proper angle, etc. This man could no more hide his training than a man without practice can fake his. The end of all this. The F.B.I. was called in, and two days later there was no Jap.

Here are a few suggestions. First, let's set up some standards for the various jobs in our industry. List the machines and make a man a first-class operator on each machine he can do all average work on from start to finish (with or without gages) from blueprint, sketch, or sample. Since there are only a few basic machines; namely, lathes, drill presses, shapers, milling machines, planers, and grinders, it would not be too difficult. The test should be made under a man who has enough common sense to recognize potential ability, and not make the test above average working conditions met in the average shop.

This will help labor as well as management, because misrepresentation never pays in the long run. The machinists who have worked with me for the past 27 years are fine men, but they all think they are entitled to more respect and appreciation for their efforts. They all agree that it's machinists who in most cases must see that the job is started, finished, and kept in working order. Can you name one single thing, living or dead, who has not or will not feel the hand of the machinist?

After 27 years in industry, I have been teaching trades for 6 years, and so far have had fair success. But I will spend the rest of my life in raising the standards of the machinist in the eyes of management. If management will only give us some of those bright young boys to work with, we will train them for key spots; they will understand their job and put industry on a higher level because of their ability. Today in many cases advancement comes from not what you know, but who you know.

This letter has rambled over a lot of space, but I am not a writer, but

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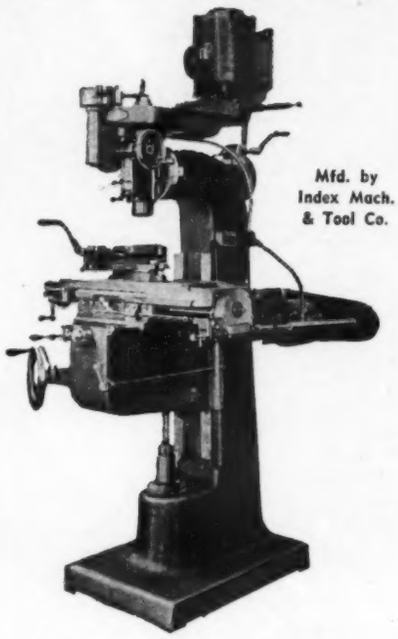
will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



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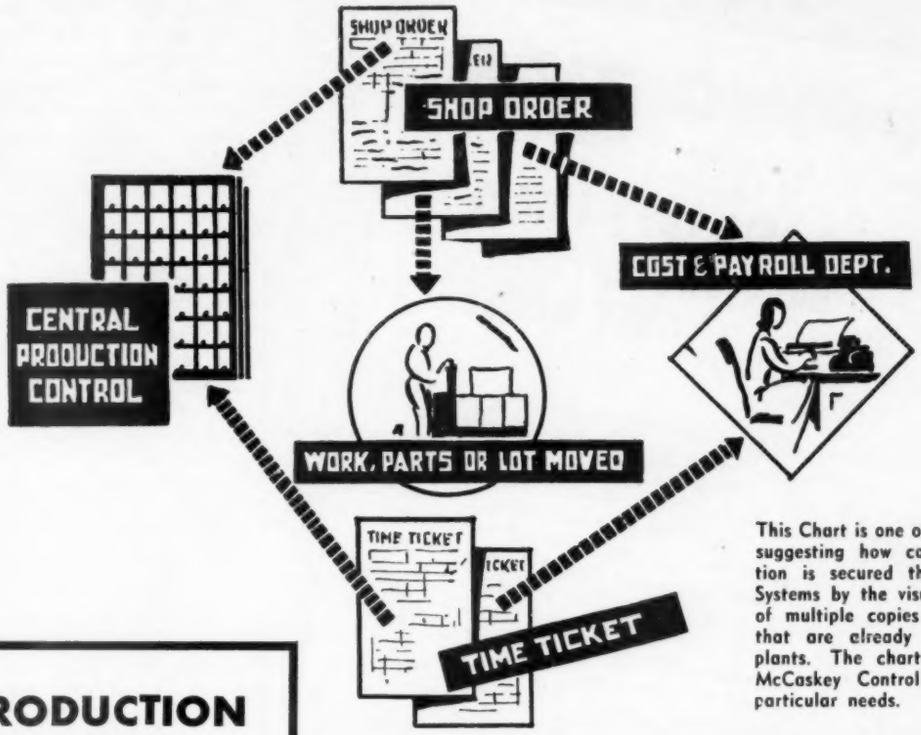

This Chart is one of a series of eight suggesting how control of production is secured through McCaskey Systems by the visualizing and flow of multiple copies of a few forms that are already in use in most plants. The charts will show how McCaskey Control will meet your particular needs.

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We have charted the A-B-Cs of McCaskey Production Control to show how easily various elements are combined to provide such control, according to specific requirements. The correct McCaskey system for your plant can be outlined only with knowledge of your requirements. The charts, however, suggest how you can select and combine the elements of control that meet your needs.

A McCaskey industrial representative, qualified by training and experience, is available to help you analyze your requirements and suggest the McCaskey Control that will best meet them. No obligation, of course.

SEND AT ONCE FOR

a copy of "The ABCs of Production Control" from which the above chart is reproduced and in which are covered a wide range of applications of control visualized simply and clearly to show how McCaskey Control operates. One of the systems shown or an adaption of it will fit your specific needs. *WRITE FOR YOUR COPY TODAY.*

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

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TAPPING TIPS

From Woody Spencer's Notebook

A DULL TAP'S LIKE A DULL RAZOR, ONLY WORSE

Started shavin' the other day without makin' sure I had a new, keen blade. Figured I could "get by". Well, the scratch and drag I got served me right. It didn't cost me any money but it started me thinkin'. Tryin' to "get by" with a dull tap won't hurt your face any but it sure will hurt the pocket book. A tap that's dull runs hard, gets hot, binds, tears threads and lots of times it breaks and you lose the tap altogether. Taps are edged, cutting tools. They should be kept sharpened, not only the chamfer but in the flutes too. That way you make sure of faster production, cleaner holes and smooth, uniform threads. And you sidestep all the troubles a dull tap can cause.

These Tapping Tips of Woody's are not intended as technical advice nor are they any cure-all for tapping troubles. They are just plain short cuts, hints and horse sense suggestions that Woody has picked up from the boys in the shops and wants to pass along for what they're worth. He just wants them to save a little time or make a job run smoother and quicker.

For the specific technical problems that come up with so many tapping jobs, we suggest definite engineering advice. Send the complete data on a job; material, depth, diameter, type of hole, lubricant, etc., and our engineers will be glad to make suggestions. No obligation, of course.

Woody Spencer's new Handy Tap Guide is full of information that will make tapping jobs easier and smoother. It's in convenient size for tool crib, shop or engineer's desk. And it's FREE. Write for your copy on your company letterhead.

NOTE: These Tapping Tips are appearing here as often as Woody gets time to write them up. Look for them.

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company

Cleveland 3, Ohio

a machinist first, last, and always. There may be an idea or two you can use. If so, I will be happy. There are so many things I have learned about men, machines, and management in my experience with industry that it is hard to keep on the subject.

George R. Miller
Kalamazoo, Michigan

•

I disagree that a trial-and-error method of judging prospective toolmaker help is the correct name for estimating a strange workman's worth or ability.

If a man has good tools (tools in good condition); and if he takes hold of his first job or two, showing his foreman he understands what is wanted and knows how to do it, the foreman can pretty well rest assured the man has at least an average skill and ability.

After all that is what most men are in any line of work, average. If a man is better than average and deserves more money this should show in a time and should be taken care of. I agree that an undue large number of newer tools do not indicate an experienced workman and should be viewed with suspicion.

I disagree with the advisability of state tests or licensing as not practical. This would vary in standards from state to state; and would not be under authority of people most interested and best able to test and grade applicants; the factories.

I am in favor of every company using apprentices, to issue a card certificate to them when they finish their time; with the company name, apprentice name, his trade, and date.

This card, in turn, would make an apprentice eligible for a union journeyman's card. He would show both to a prospective employer, who would know from these cards that the applicant had a working knowledge of his trade.

This arrangement, I believe, would eliminate any friction that might arise between employer and union from state regulation; and is one I am in favor of.

Albert Lyon
Toledo 7, Ohio

•

The question is moot in the light of what the word really means. How could a piece of paper, issued by a State, make a machinist? How could it make him a better one if he already claimed he was one?

Machinists are born, not made, and some of the very finest mechanics in the world, skilled and resourceful,

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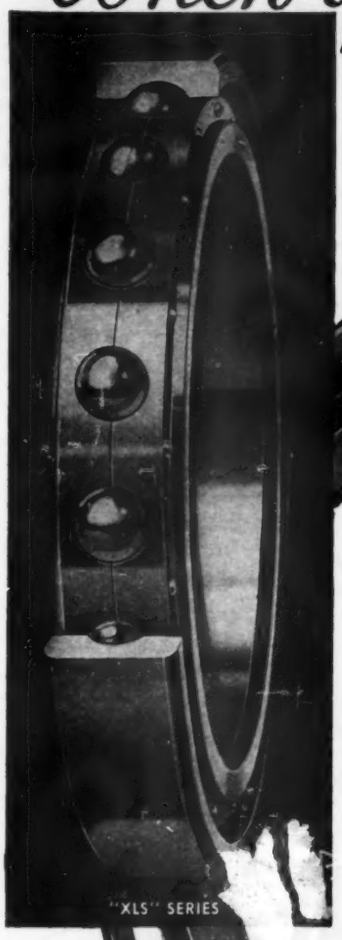

HAVING bores abnormally large, as compared with the outside diameter, they offer definite advantages under certain conditions found in machine design. You may have them in several different types, *affording compactness, light weight, and greater latitude in your design.*

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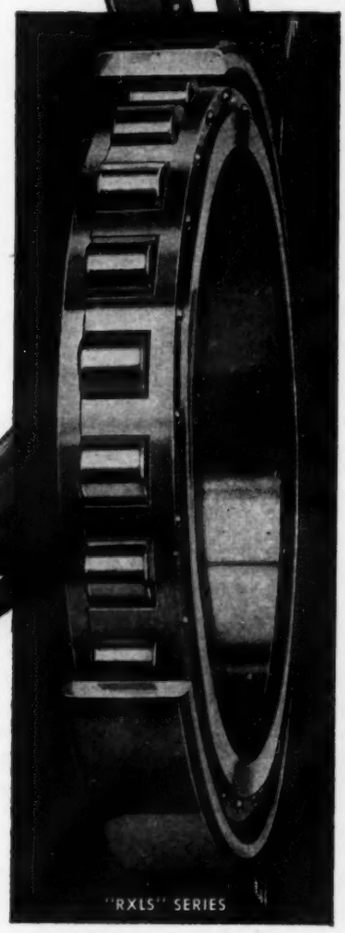

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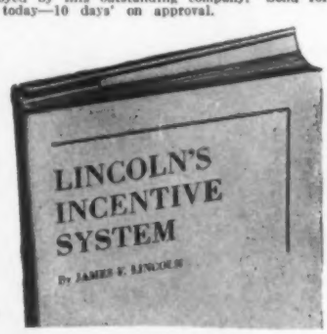

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never used a micrometer or a vernier.

The only sure-fire process of judging his claim to the title, is by the trial-and-error method. The trouble in industry today of judging a machinist's worth and ability lies with industry itself.

Industry has cheapened the title of machinist by its creation of machine hands—calling them, lathe hands, drill press operators, milling machine hands, etc.

Of course there is a reason for this, not difficult to see, but therein is born the complaint of foremen and personnel managers that, they cannot believe a new employee is a machinist without subjecting him to the trial-and-error test.

Today, the union card attempts to grade all such operators as full-fledged machinists and it's little wonder that a foreman finds so many of his new men so poorly equipped to be classed as skilled mechanics. Licensing machinists in their trade offers no solution to the problem. The unions have a way of seeing to it that their members would all be provided with a license, regardless of their skill or ability, which in turn would provide the unions with more fortified bargaining material. It would make all its members made-to-order machinists.

Wm. H. Wilson
Alhambra, Calif.

SMALL SHOP POOL?

There is a definite advantage accruing to the small shop owner who can work out a pooling arrangement with his competitors. The idea of pooling is not new and assumes various forms. The small shop owners have lost a good deal of business because they lacked some facility necessary to carry out the provisions of a contract. To enumerate a few: Lack of capital to carry a big contract; lack of machine capacity to finish the job by the specified date; lack of a piece of equipment necessary to perform the required operations; lack of inspection equipment to reduce scrap losses; and last, but not least, lack of experience and knowledge required to take on big jobs involving large amounts of money.

These obstacles can be reduced but not eliminated by the pooling of resources by the small shop owners. Good business practice, however, demands that all arrangements be strictly contractual. This will eliminate a lot of headaches later on.

Small shop owners are usually good mechanics but poor businessmen. They are usually rugged individualists by nature but they can work together, as past performance will show.

However, to make a success of a pooling arrangement, the parties should engage a competent business administrator who will be the final judge of the responsibilities of the individual owners under the contract. If this precaution is not taken, the whole thing will wind up in court, with all losing instead of gaining.

Charles E. Livingway
Detroit, Mich.

TRADE PUBLICATIONS

Magnifying Glass—Pocket Folder entitled "Super Sight" describes a bracketed lens-light unit for close inspection work. The Boyer-Campbell Co., 6540 St. Antoine, Detroit 2, Mich.

Hydraulic Elevating Table—Bulletin 141 illustrates and describes a table on casters which has many uses. For loading, unloading, transporting and machining heavy castings it is a time-saver as it greatly reduces the manpower required. Lyon-Raymond Corp., Greene, N. Y.

Dielectrics-Insulation—32-page engineering manual discusses every phase of electrical insulation from basic theories to ASTM standards for all classes of service. William Brand & Company, 276 4th Ave., New York 10., N. Y.

Cutter Grinder—Folder JHA-16 illustrates and describes several typical grinding problems and the application of this grinder to their solution. One feature is the 30-in. sine bar and centers for grinding taper reamers within 0.0001 in. Joshua Hendy Iron Works, Sunnyvale, Calif.

War Turns a Page in Metal Processing—Correction

A RECENT REPORT under the above title included a description of the martempering process in the discussion of heat-treating developments. The statement was made that, "In the martempering process, the steel is held in the bath until the start of the transformation when it is cooled to room temperature by means of an oil quench." This is not entirely correct. Martempering consists of heating to austenitic temperature and then removing the workpiece to a salt bath held between 400 and 700 F. The work is left in the salt bath until the temperature is equalized throughout and is then removed for air cooling. There is never any transfer to an oil bath.

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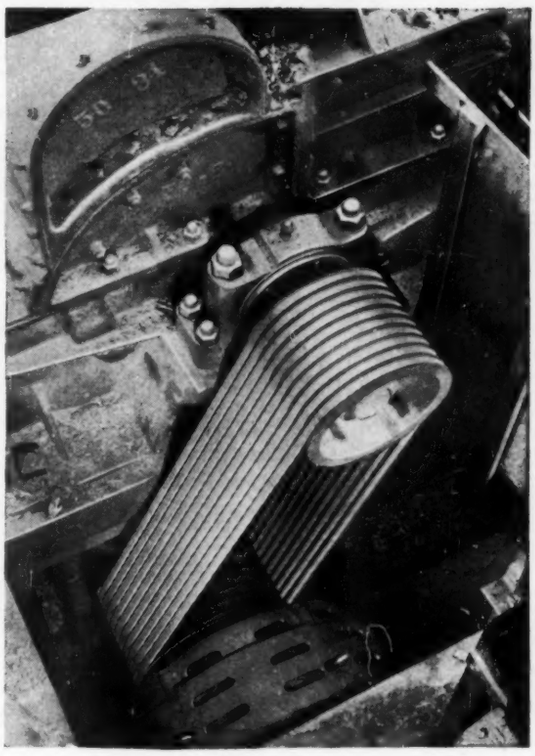

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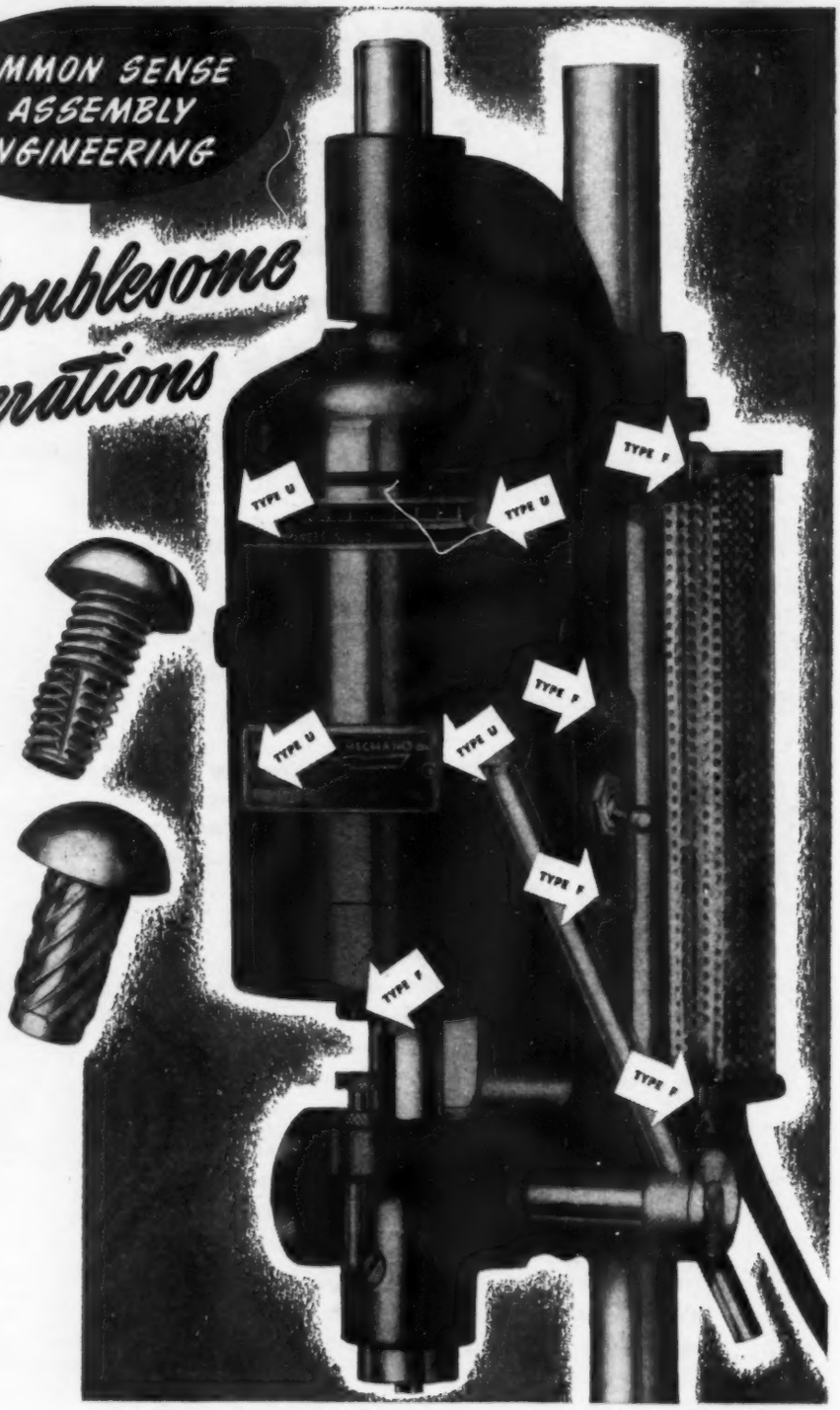

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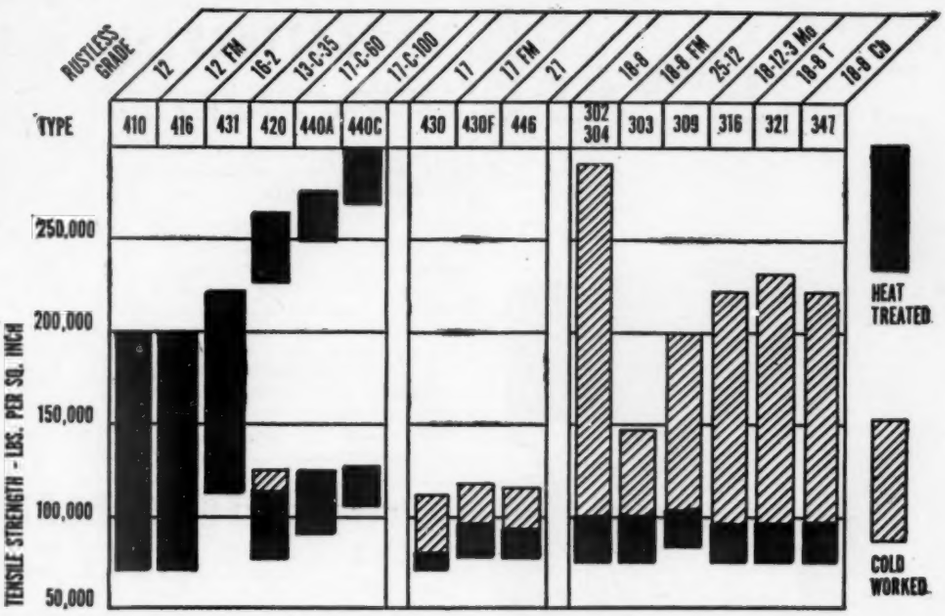

THE above chart shows the tensile strength of representative grades from the three basic groups in stainless steels.

The first group, Straight Chromium, responds to quench hardening and tempering much like plain carbon steels, though yielding higher tensile strengths with good ductility. Carbon content is varied progressively up to 1.10 max., the proportion of carbon and chromium determining both strength and corrosion resistance. In general the higher the carbon and lower the chromium the greater the quench hardness. Resistance to corrosion and oxidation at high temperatures increases with increased chromium content. These grades are resistant to atmospheric corrosion, mine waters, fruit and similar acids. May be used for plant equipment, as in valves or parts subject to wear and erosion. Maximum corrosion resistance is developed when fully hardened and polished, for cutlery, surgical instruments, etc.

The second group, Straight Chromium, is more highly resistant to corrosion, due to the presence of additional chromium, but heat treatment does not increase its strength. Suitable for equipment handling acids, chemicals, foods when the high strengths of the first group are not required.

The third group, Chromium-Nickel, is likewise not responsive to hardening by heat treatment, except case hardening by nitriding. Cold working, however, materially increases strength to figures approximating the first group. This means that progressively higher tensile properties are available only in progressively smaller or thinner sections. Due to the presence of substantial amounts of both chromium and nickel, these alloys possess the highest corrosion resistance, and hence have found wide application in the refining and chemical industry. Several alloys in these groups also have unusual heat-resisting properties.

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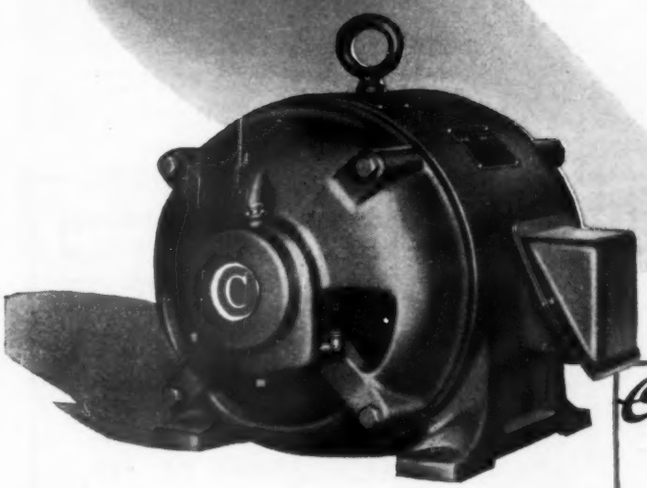

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CENTURY ELECTRIC COMPANY • 1806 Pine St., St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

On a big fellow like this

A 36" heavy four-ply Tannate leather belt driving an ammonia compressor for more than four years. 600-800 H.P. load. 6100 F.P.M. Giving excellent service. Pulley ratios are bad, speed high and load heavy.

Or a little fellow like this

A vertical base type Rockwood Flat Belt drive operating a lathe in a metal working plant.

Tannate

WATERSHED LEATHER BELTING assures

. . . more delivered power
. . . greater efficiency
. . . lower maintenance

Whether driven from long or short centers, with group or individual drives—your machines are most reliably belted with Tannate flat leather.

It has very high coefficient of friction and great pliability that helps keep your machines running at full capacity: this means increased output at lowered unit cost.

Tannate has unusually high tensile strength which contributes toward increased service life, and lower end cost. It is treated to resist moisture, oil and weak acids: it stays on the job . . . requires little maintenance.

Tannate leather belting, through decades of use on industries' really tough drives, large and small, has proved really good. May we show you where it can benefit you?

J. E. RHOADS & SONS • Est. 1702
35 N. SIXTH ST., PHILA. 6, PA.
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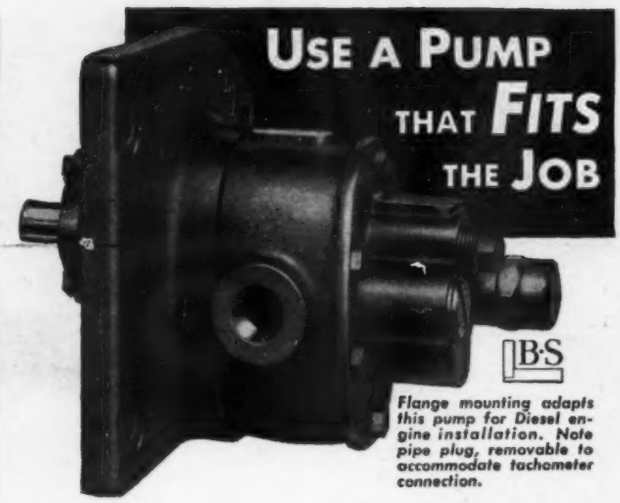
USE A PUMP THAT FITS THE JOB



Flange mounting adapts this pump for Diesel engine installation. Note pipe plug, removable to accommodate tachometer connection.

Frequently it takes a special pump to fulfill installation requirements satisfactorily. Special drives, integral or flange mountings, multiple outlets, dual services and other special adaptations solve many perplexing pump problems. This service is described in our pump catalog. Copy on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

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Phillips Screws pay Pullman

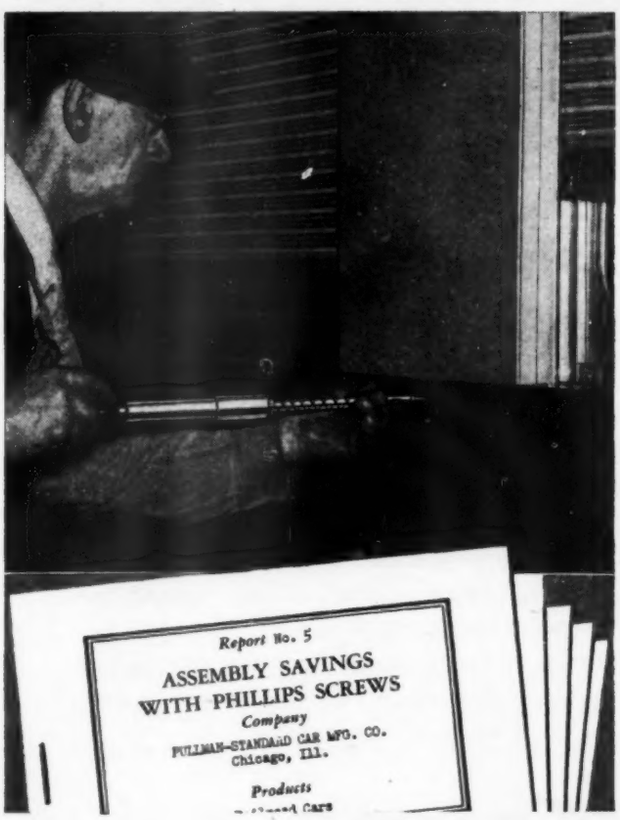
big money savings for hundreds of driver skids eliminated! Hold better ... look better!

Investigators from James O. Peck Co., industrial research authorities, are visiting a number of representative plants to get authentic FACTS on assembly saving. Get the "INSIDE STORY" of successful assembly practice — read his fact-filled reports!

"When we used slotted screws, we had plenty of trouble with drivers slipping and puncturing the pressed wood panels we use by the thousand for inside trim," a Pullman assembly executive told the investigator. "This meant removing and discarding the panel, replacing and hand-painting – to the tune of several dollars per skid. Phillips Screws ended driver skids. But that's only one way they pay off.

"Where the heads show in the finish they look better. They don't have to be lined up, like slotted screws, which means they can be set up tighter to resist vibration.

"Railroads like them because they can't be loosened by passengers with coins or nail files like slotted screws – to tear clothes and cause damage claims."



REPORT TELLS MORE PHILLIPS ADVANTAGES

The investigator asked Pullman the same questions you would ask about assembly methods. The report tells you the complete, revealing answers.

It's one of a series of assembly studies covering all types of products – metal, plastics, wood – being made to show how the many Phillips Screw advantages add up big savings you can make in your assemblies.

The reports now ready – and more to come – comprise a practical manual of modern assembly methods – never-before-printed information – inside facts you'd pay good money to get – and you can have them, now, FREE!

PACKED WITH IDEAS FOR SAVINGS IN YOUR ASSEMBLIES

Find out how industry's top-flight assemblers licked problems like your own! Get these reports! Don't wait – fill out and mail the coupon TODAY!

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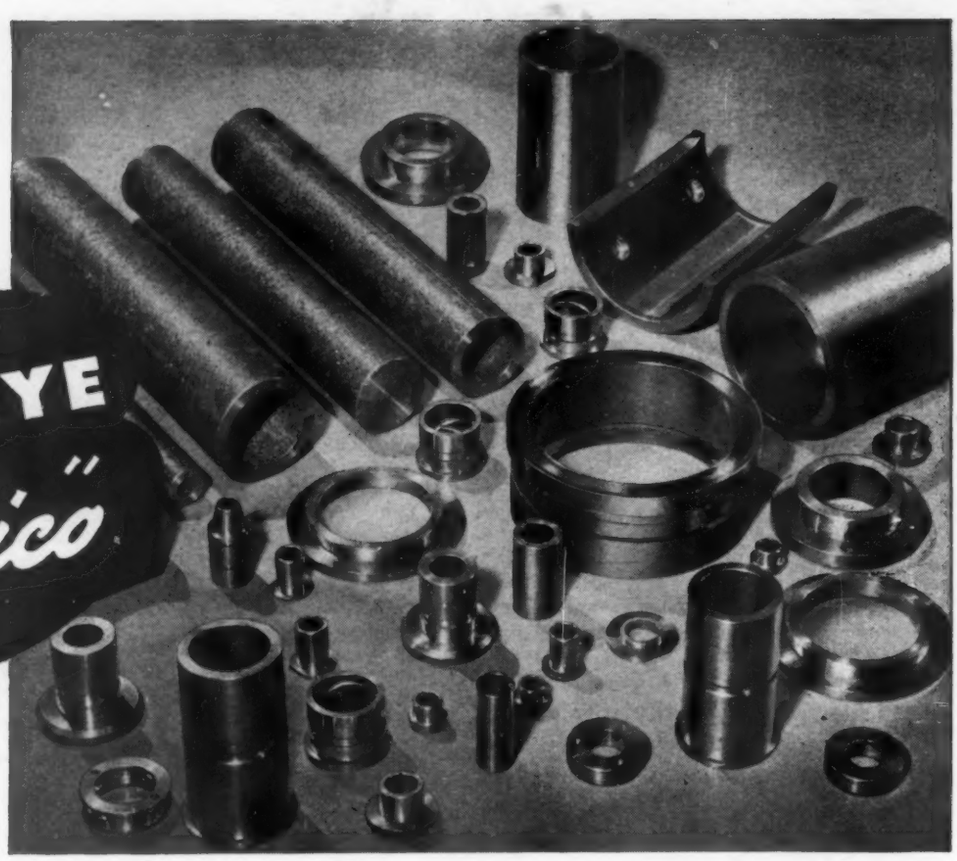

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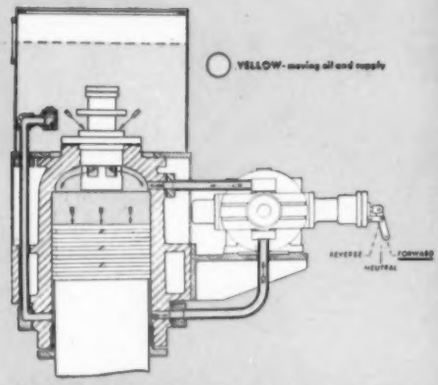
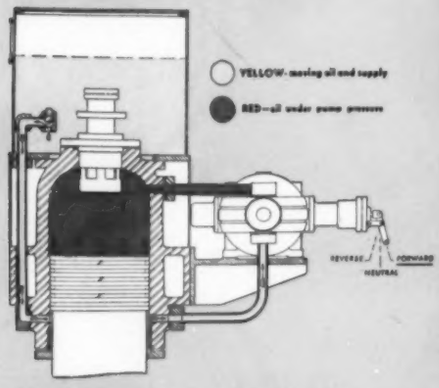
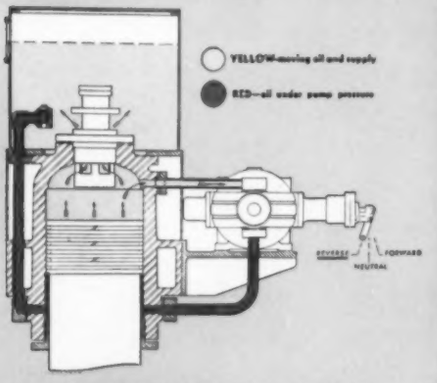


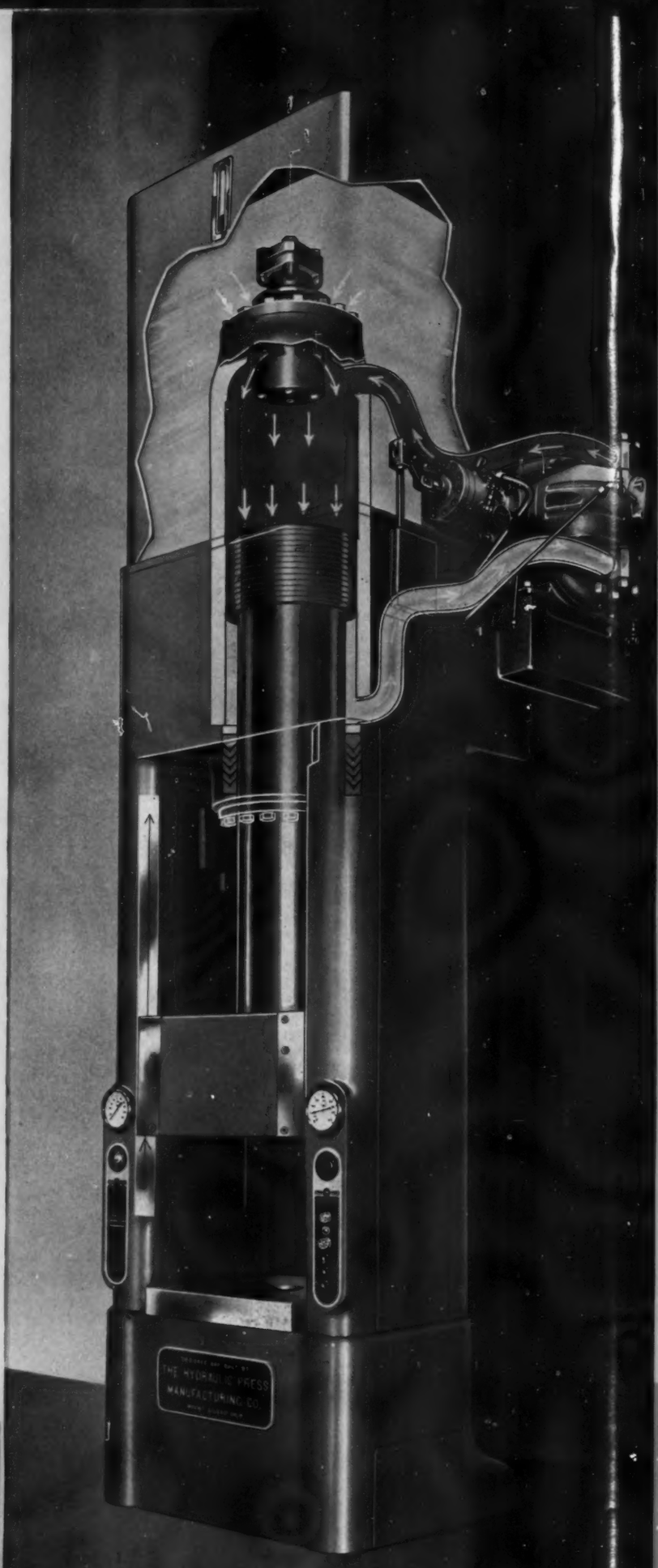
FAST RAM ADVANCE—The H-P-M radial pump withdraws oil from the differential ram supporting area. The press ram rapidly advances to the work. Its speed is definitely governed by the rate the oil is withdrawn from the differential ram area. During rapid ram advance, the press cylinder is prefilled by gravity from the overhead oil supply tank.



RAM ADVANCE UNDER PRESSURE — The advancing ram encounters the resistance of the work. At this point, the ram continues its forward travel but at reduced speed, being propelled solely by the oil delivered by the radial pump. As soon as a predetermined pressure is built up on the work, the delivery of the radial pump is automatically reversed.



FAST RAM RETURN—The pump now delivers oil to the differential ram supporting area. The H-P-M **FASTRAVERSE** valve opens automatically, re-establishing communication between cylinder cavity and overhead tank. The press ram retracts from the work at a rapid rate, its speed being determined by the rate at which the pump delivers oil to the differential ram area.



DEEP METAL DRAWING

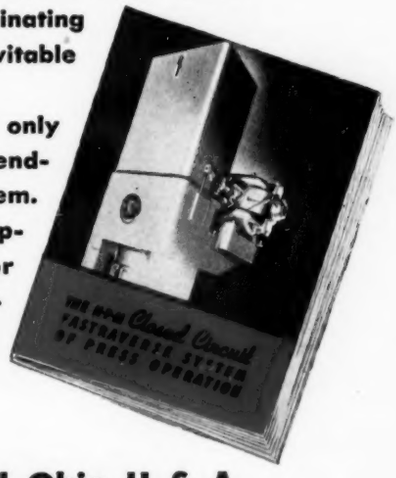
RUBBER PAD FORMING

H·P·M "Closed Circuit"

. . THE MOST REVOLUTIONARY HYDRAULIC PRESS DEVELOPMENT EVER MADE ! !

The H-P-M "CLOSED CIRCUIT" FASTRAVERSE SYSTEM is the modern method of hydraulic press operation for production service. It has been thoroughly established by hundreds of important industrial applications.

The H-P-M "Closed Circuit" System provides for regulation of both speed and direction of every press ram movement through control of the output of the pressure-generating H-P-M radial pump. The two ports of the pump are connected directly with the two sides of the press ram. No reversing valve is employed. Instead, the reversal is accomplished by changing the eccentricity of the pump plungers in relation to the pump cylinders. During the press reversal, the pump discharge is decreased at a uniform rate to zero, and increased at a uniform rate in the opposite direction. At the instant when actual reversal takes place, the flow of pressure fluid is stopped, thus eliminating the sudden impact of fluid flow at full pump discharge, and its inevitable shock to the entire hydraulic system and press structure.



The successful performance of the H-P-M FASTRAVERSE PRESS not only results from its "Closed Circuit" System of operation, but it is also dependent upon each of the hydraulic components which make up this system. These include all of the hydraulic pressure-generating and control equipment, which is built from patented H-P-M designs, expressly for heavy-duty hydraulic press operation. This unity of origin and manufacture of both operating equipment and press, not only assure coordinated functioning, but also undivided responsibility to the user.

Write today on your company letterhead for your free copy of H-P-M 32 page bulletin describing this revolutionary "Closed Circuit" method of hydraulic press control.

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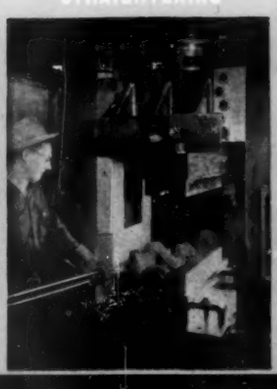
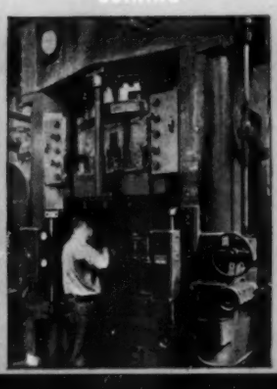
Representatives in other principal cities.

FORGING

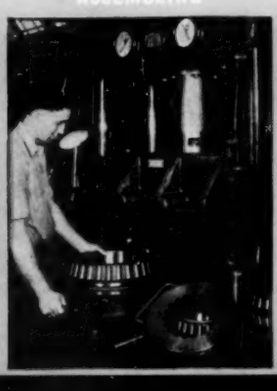
STRAIGHTENING



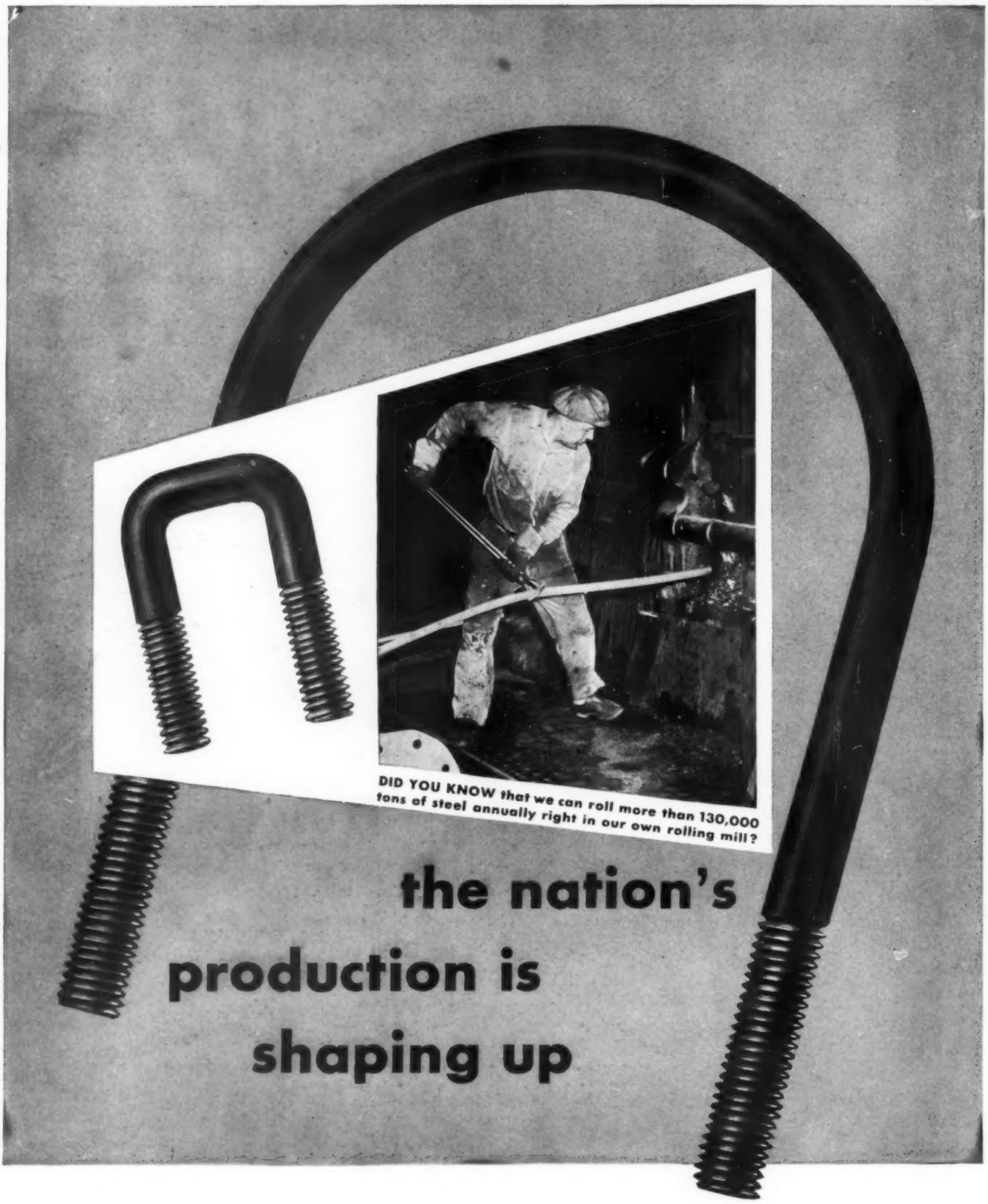
COINING



ASSEMBLING



POWDER METALLURGY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the nation's
production is
shaping up

Our nation's industries are in the process of reconversion to a peacetime operation of manufactured "miracles"..."miracles" which call for nuts and bolts of unusual design.

Already thousands upon thousands of special circle Ⓑ fasteners are being produced at our plant —*the largest independent in the country*—for progressive manufacturers everywhere.

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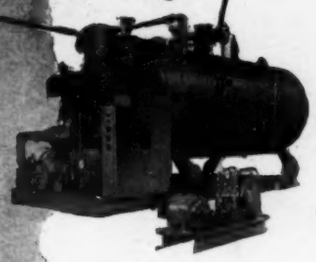
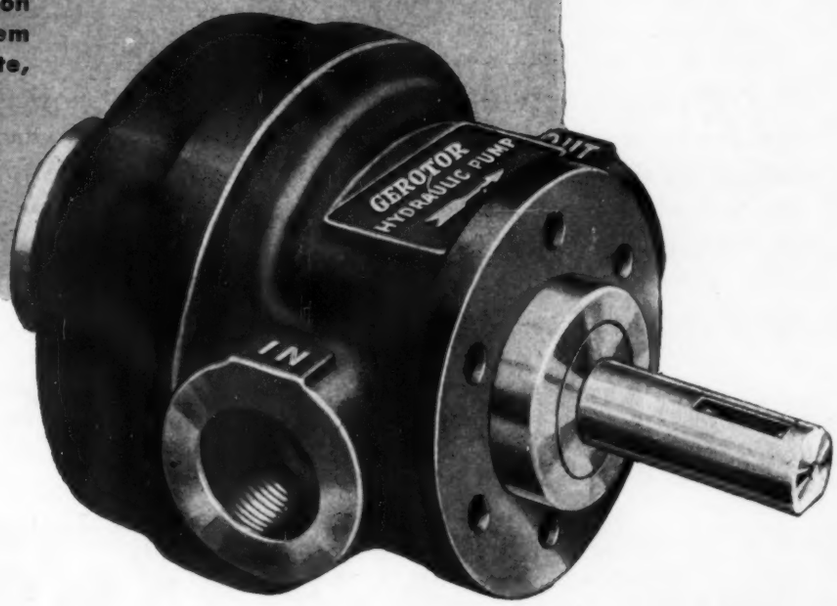
HYDRAULIC PUMPS

"do a job" for CYCLOTHERM STEAM GENERATORS

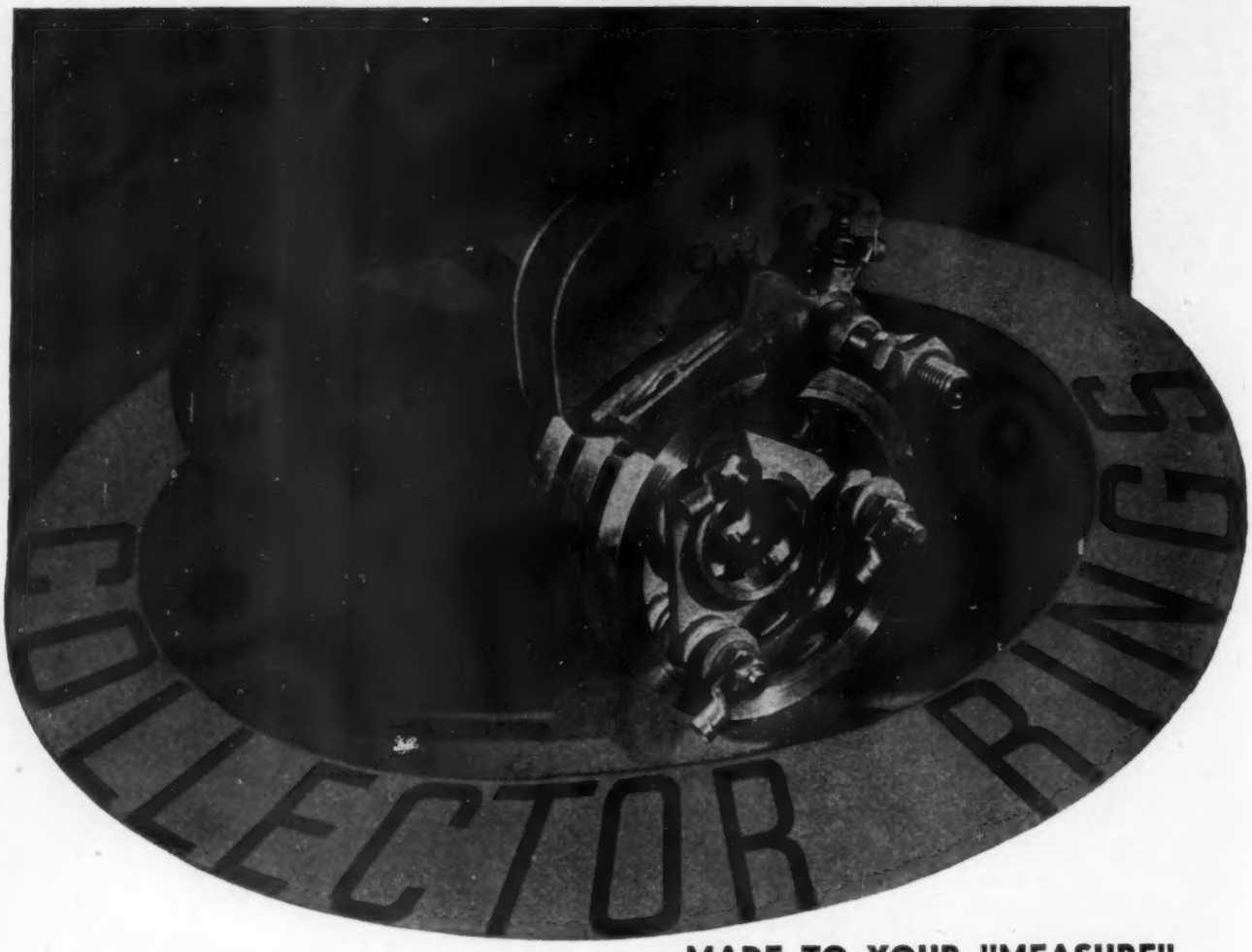


Gerotor Hydraulic Pumps are taking on new tasks in many fields of peacetime industry. On Cyclotherm Steam Generators, for example, Gerotor's dependable operation eliminates the hazard of pump failure when the Cyclotherm is called on to generate steam at high efficiency.

Gerotor's unsurpassed record of top performance and low-cost operation makes it the preference of industrial leaders who have intricate pump problems. If you have a difficult hydraulic pump application, place it before Gerotor's staff of engineers. There is no obligation —no delay. Your problem will be given immediate, courteous attention.



GEROTOR MAY CORP., BALTIMORE 3, MD., Plants at Logansport, Ind., Baltimore, Md.



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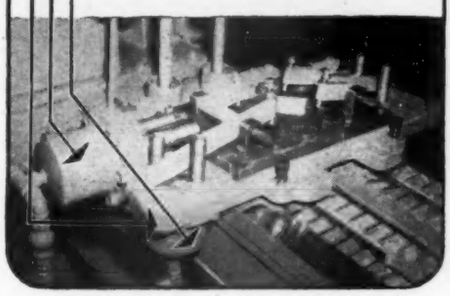

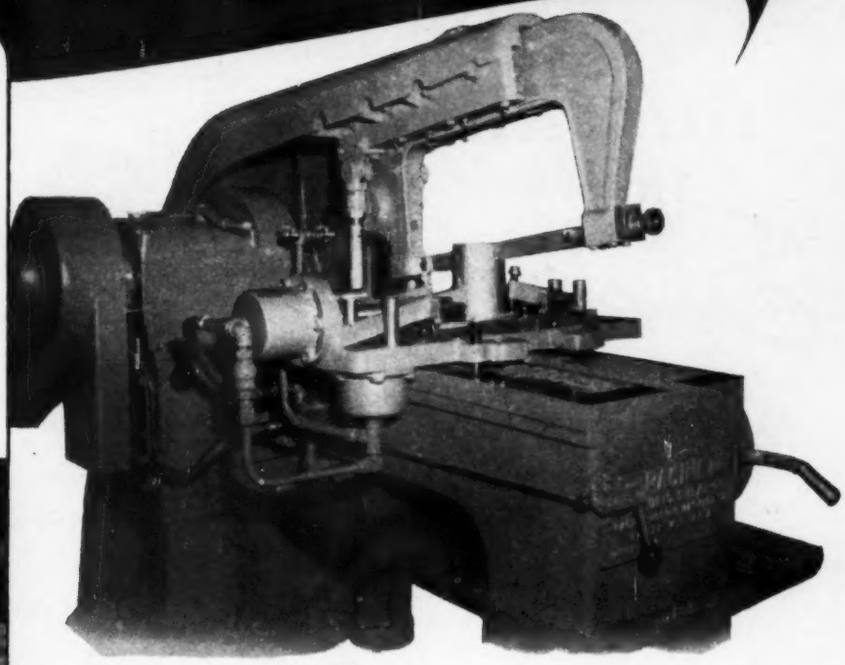

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10" x 10" Capacity

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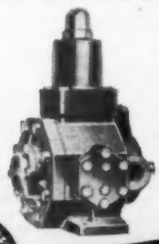

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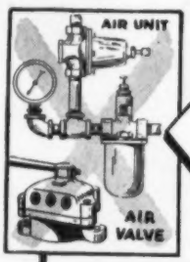
The "GUSHER"—A Modern Pump For Modern Machine Tools



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★DELAYED ACTION VALVE
— for single control of multiple operations
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— for 4-way operation
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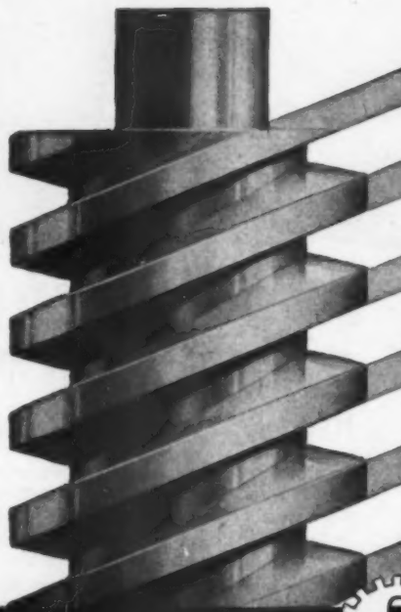

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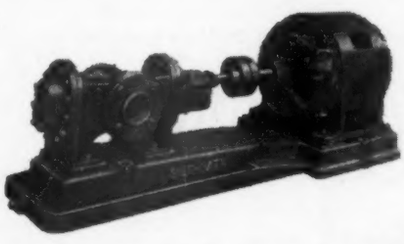

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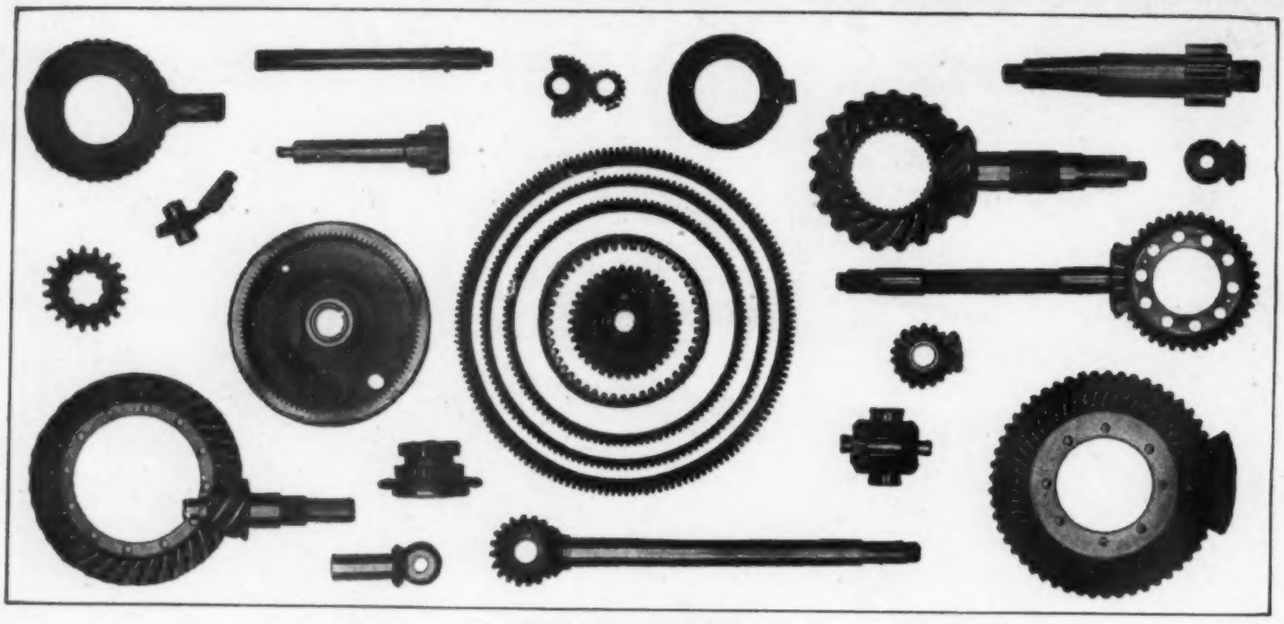

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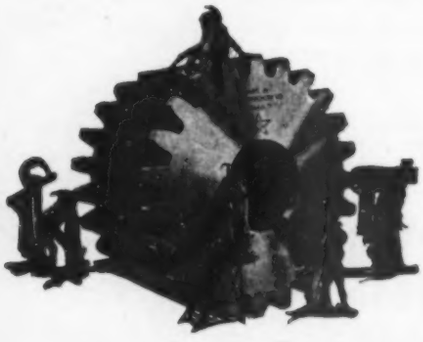

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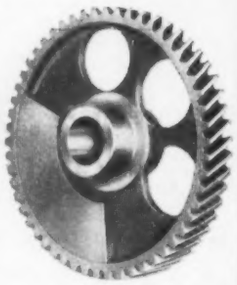

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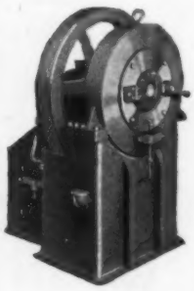

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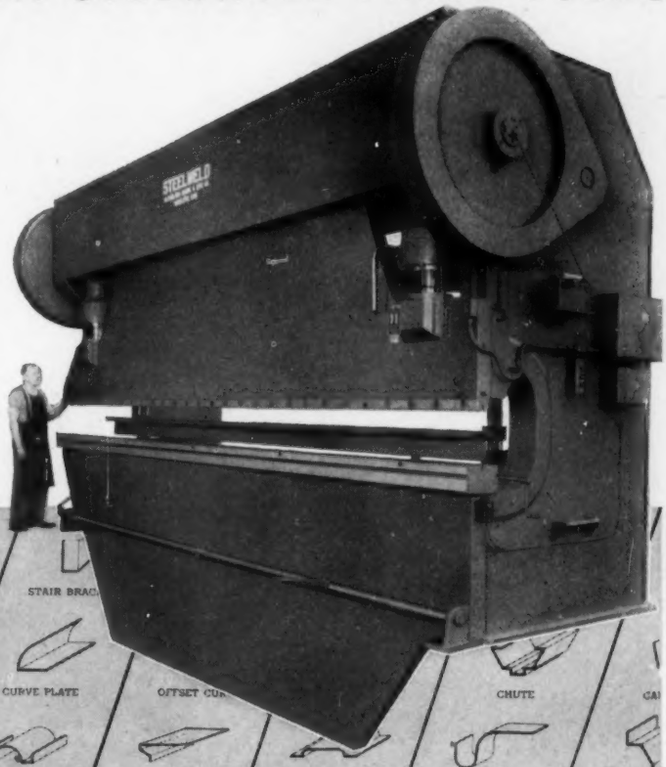

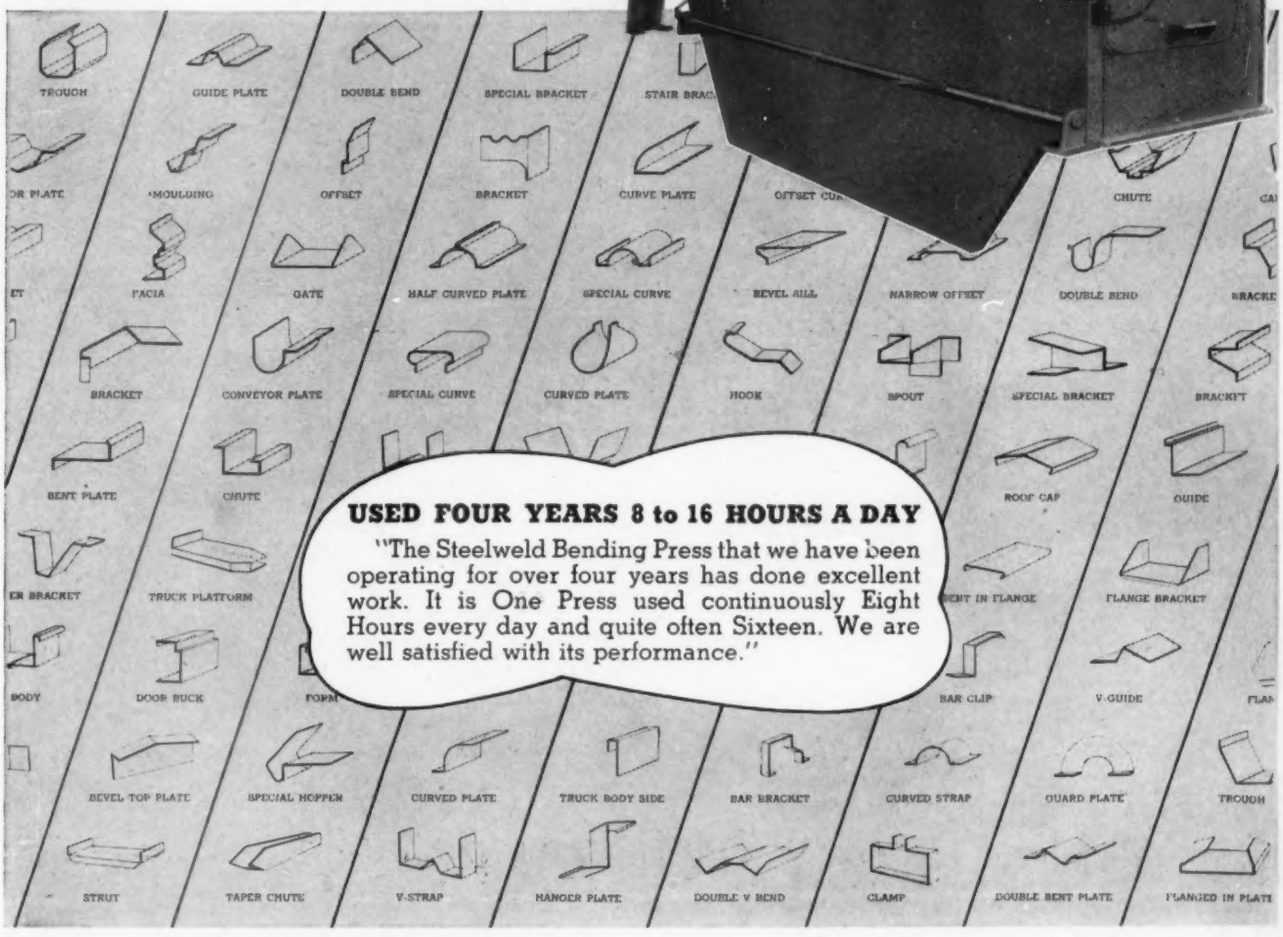

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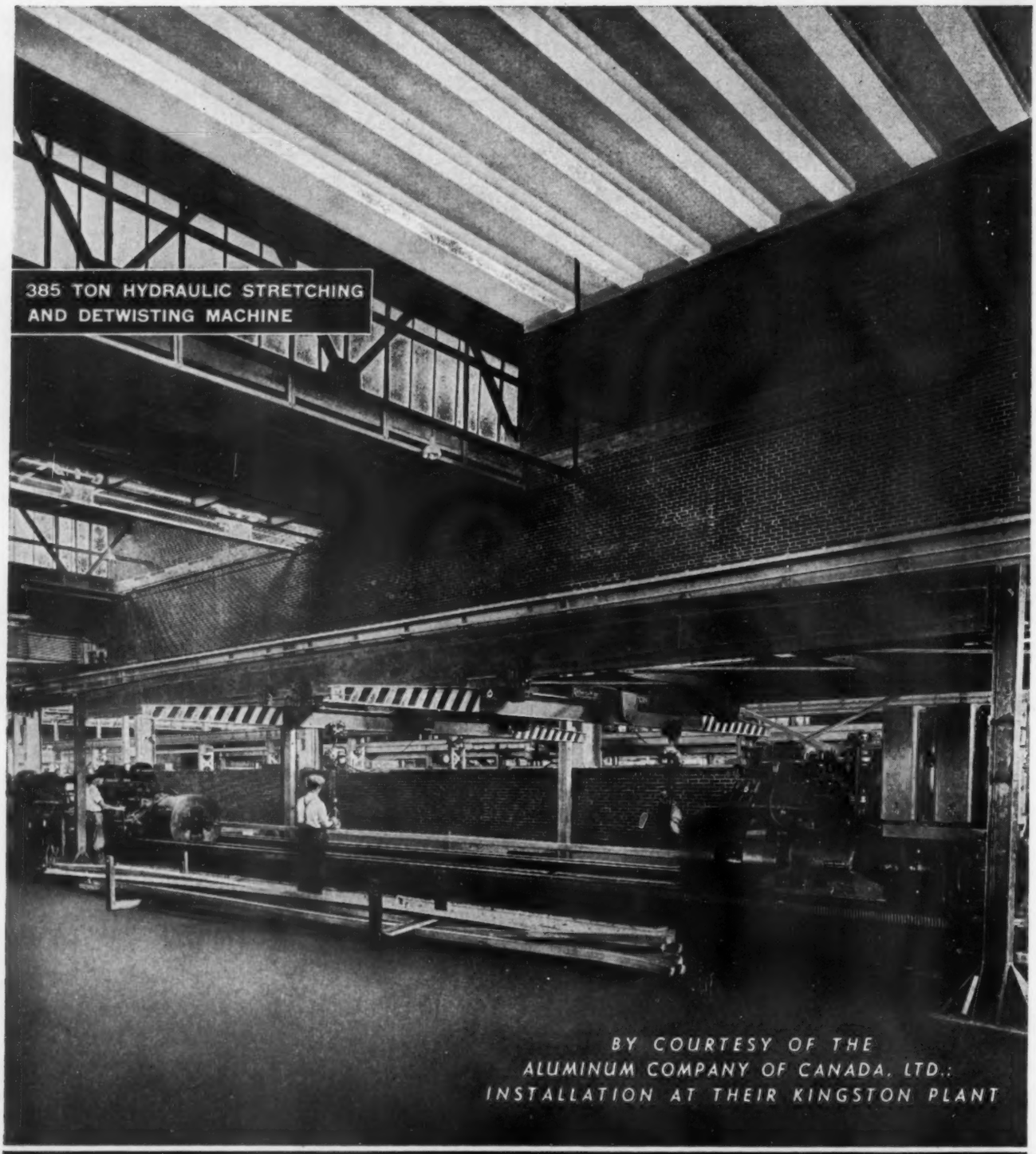

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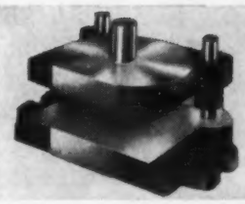

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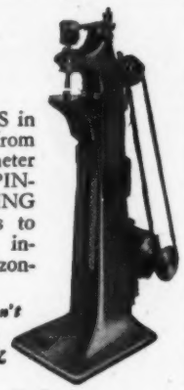

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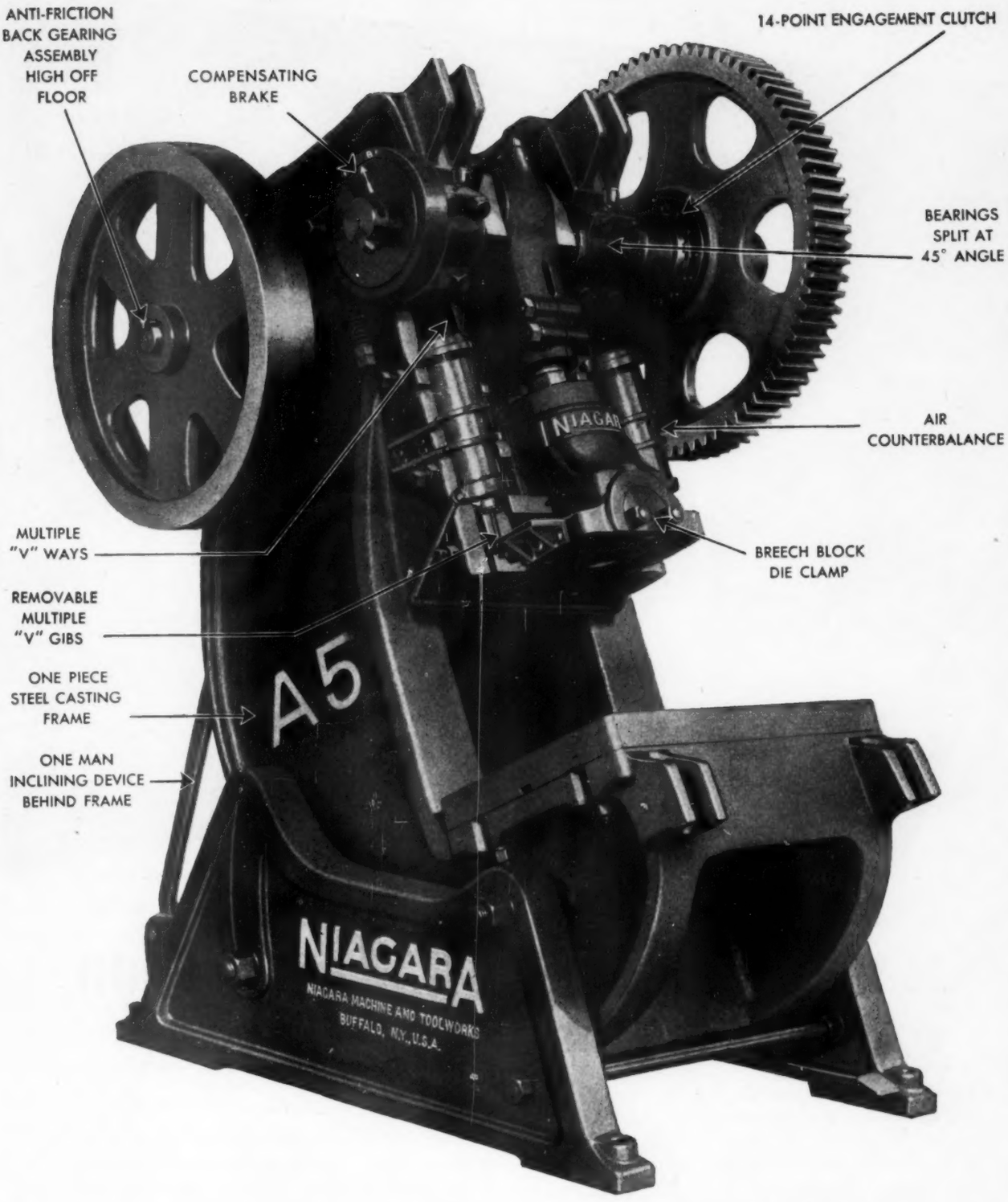

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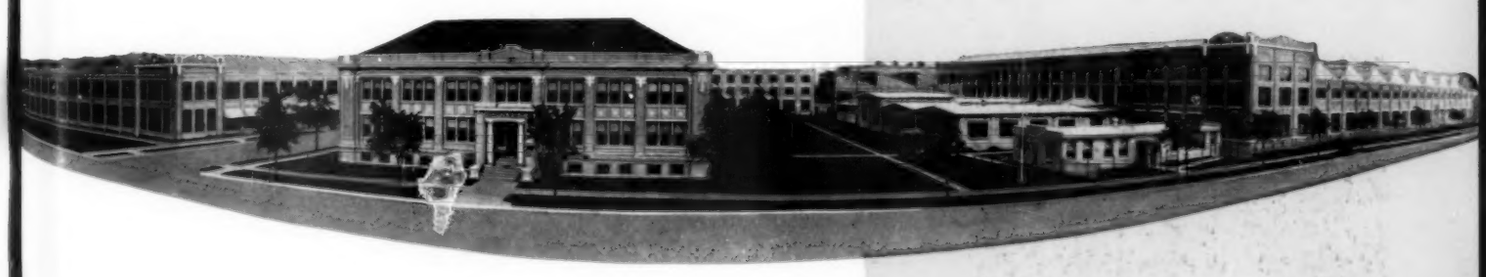
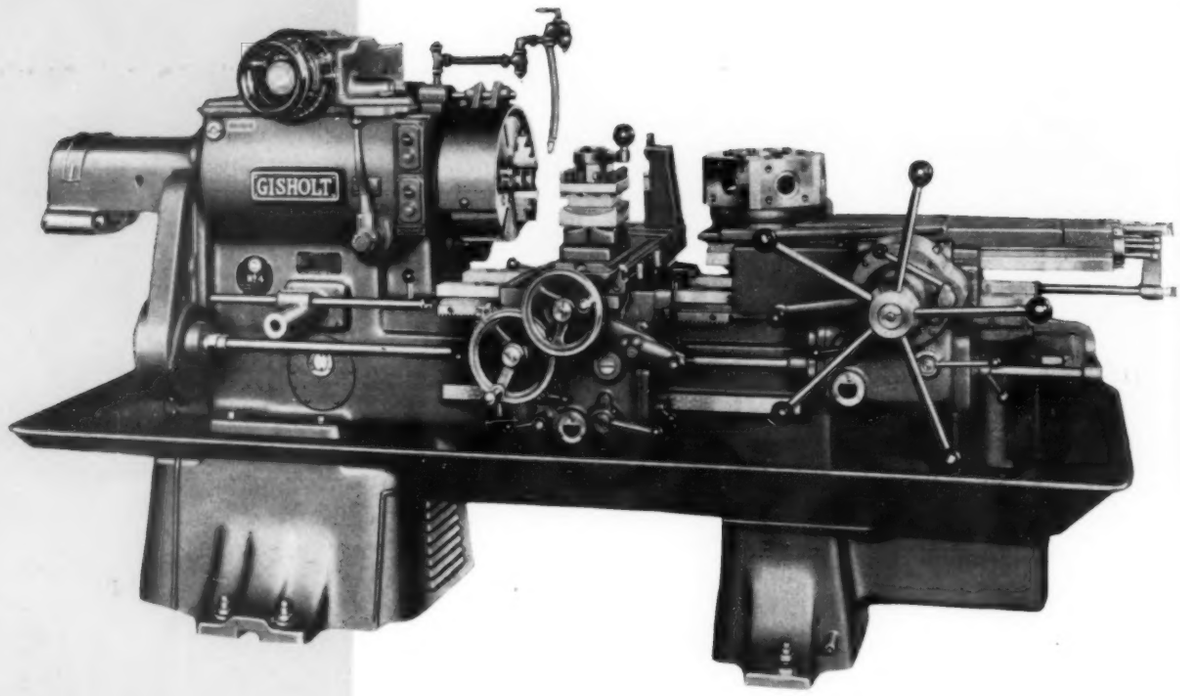
If your product involves round or partly round metal parts, you can profit through the use of Gisholt engineering assistance and equipment, described in the following pages. Today, more than ever before, it's wise to "Look Ahead—Keep Ahead—with Gisholt."





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Built in three sizes from 1½" to 2½" round collet capacity and with swing over ways ranging from 18½" to 19¾". Gisholt Ram Type Turret Lathes combine extremely rigid construction with a number of outstanding operating advantages to assure easier, faster production of parts at lower cost.

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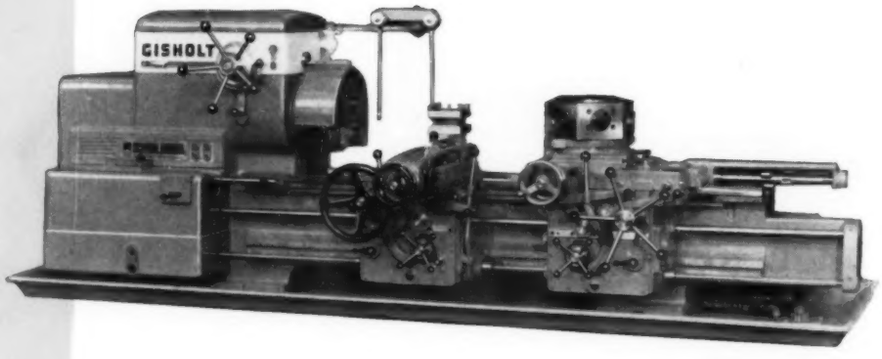
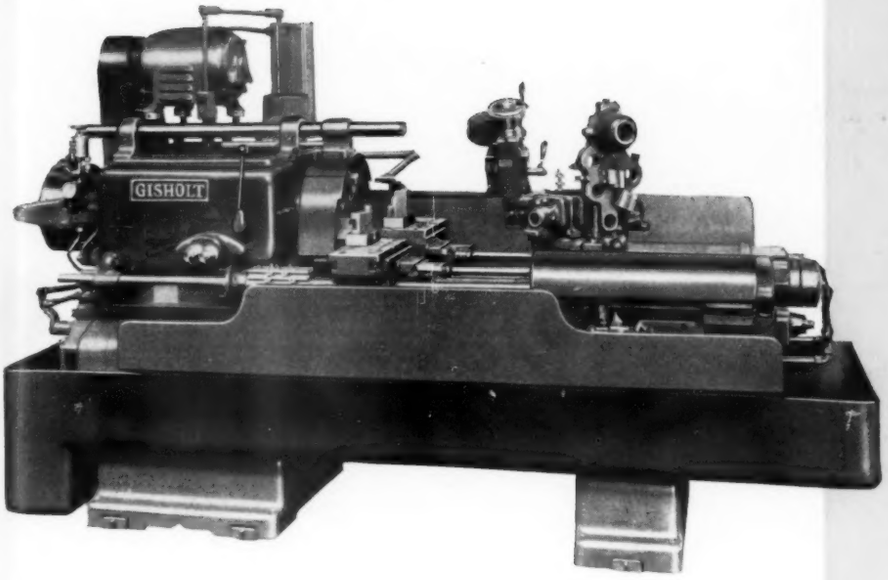
Available in 5 sizes with spindle bores ranging from 3 1/16" to 12½" and with swing over ways from 19½" to 36½". On Gisholt Saddle Type Lathes, many of the machine functions have been made automatic or semi-automatic, reducing physical effort and speeding up the operating cycle to cut machining costs to a new minimum. The largest and heaviest of these machines require no more operating effort than many smaller lathes. All models are available with fixed center or cross feeding hexagon turret.

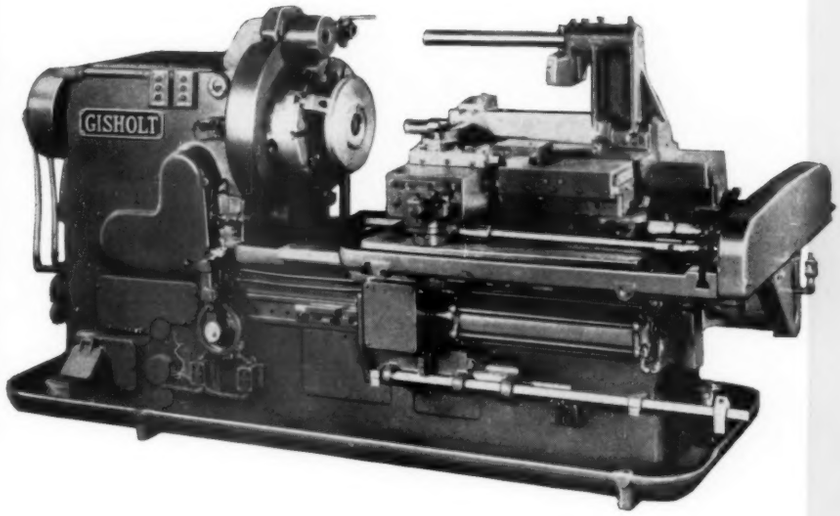




The Fastermatics—
Automatic Turret Lathes

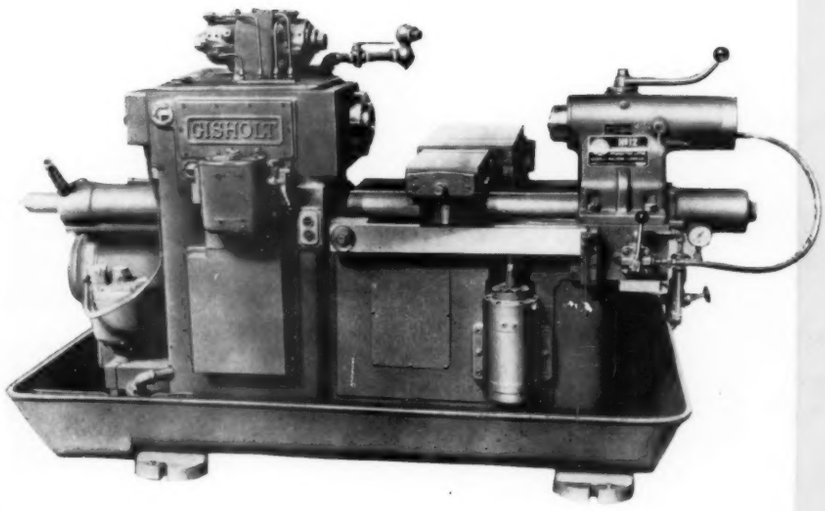
Four different sizes with swing over bed ranging from 21" to 35½". The Fastermatics are universal automatic turret lathes with an hydraulic feed system and automatic speed controls which may be changed easily from one set-up to another. The principle of operation is the same as the turret lathe, except that the entire machining cycle is automatic. Designed for high production turning, but may also be used on comparatively small lot work.

automatic lathes



The Simplimatic

Swing over ways is 33½". The standard platen type machine permits a wide variety of tool arrangements with two or more heavy duty slides, each with its own drive, rate of feed, and direction of feed, but all driven from and accurately timed with the spindle. All machine functions are completed automatically. Its basic simplicity provides the advantage of a machine designed specifically for the job. Available also as a vertical head machine.



The No. 12 Hydraulic
Automatic Lathe

Swing over bed is 16¾". Essentially different from other machines, the No. 12 offers important advantages in its unusual versatility, remarkably easy set-up, fast production, and the ability to duplicate parts within close limits, year after year. Its control devices are extremely simple and dependable. It performs equally well on arbor or between-centers work, chucking jobs, or work held in special fixtures. A genuinely rugged lathe also suited for light, fast work.

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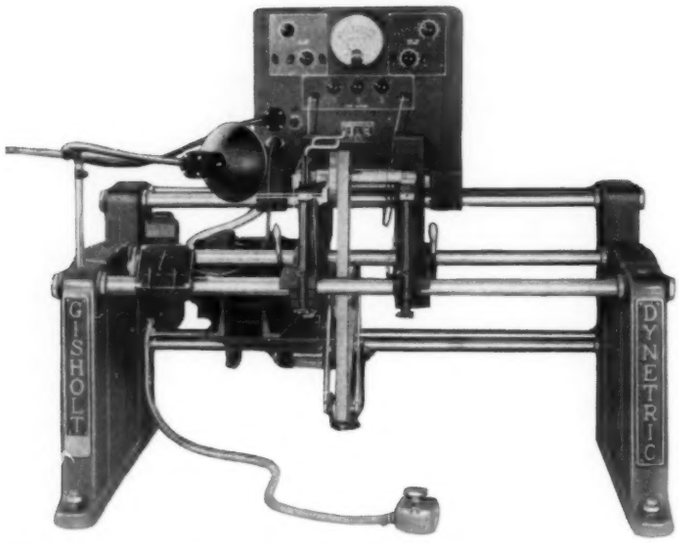
dynetric balancing machines*



Gisholt Dynetric Balancers are built in a variety of sizes and styles to provide accurate static and dynamic balance for any part, whether it weighs a fraction of an ounce or many tons. These sensitive machines quickly locate and measure unbalanced forces for accurate correction. Simple and easy to operate, they have put the balancing of individual parts, or complete assemblies, on a low-cost production basis.

*Developed jointly with Westinghouse Electric Corporation.

Gisholt Static Balancing Machines are also available for use on such parts as flywheels, fans, pulleys, airplane propellers, etc.

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Where standard equipment does not fulfill your special requirements in the most efficient manner, Gisholt's half century of experience in the designing and building of machine tools is at your disposal. Inquiries concerning special machines for the performance of unusual applications, or for combined manufacturing operations, will receive prompt and careful attention.

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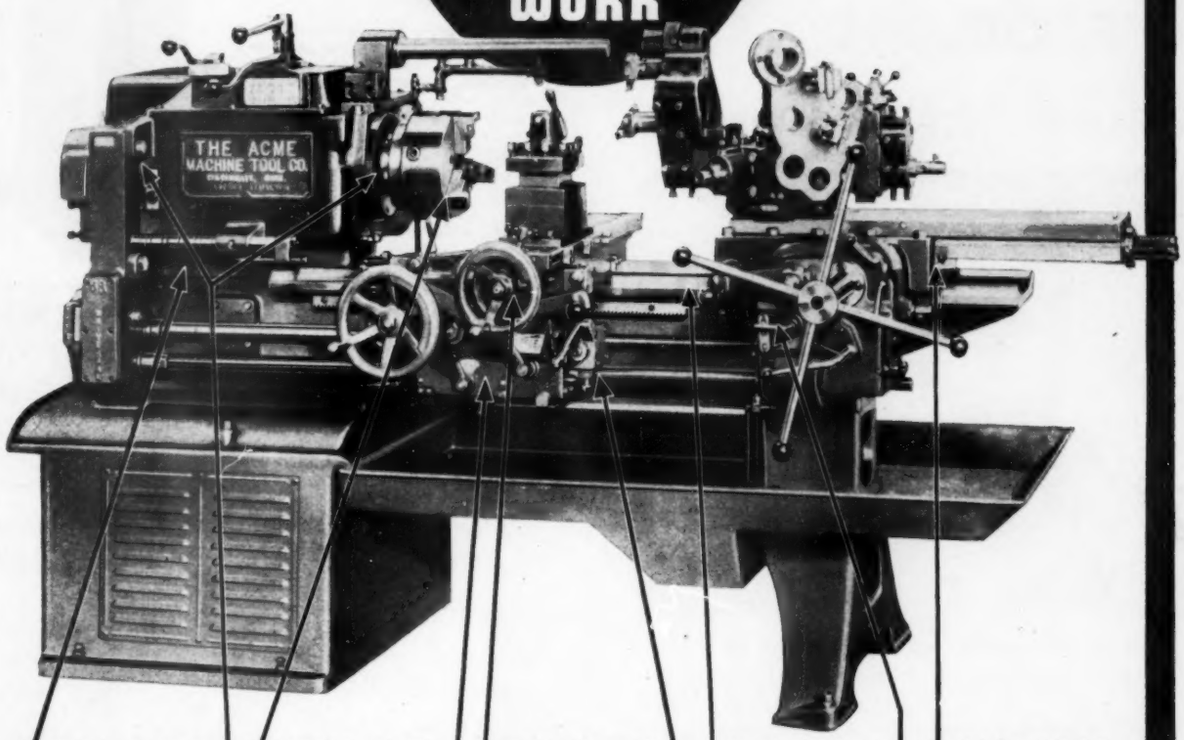
for accurate, speedy - low cost

CHUCKING WORK



- NON-OVER HANGING HEAD STOCK
- THREE JAW UNIVERSAL CHUCK
- TWIN-NUT BACK LASH ELIMINATOR ON CROSS SCREW
- HARDENED STEEL VEE'S ON BED
- HARDENED STEEL RAM SLIDE BEARINGS
- TRIPLE ROLLER SPINDLE BEARINGS
- INDEPENDENT FEED RANGES FOR EITHER APRON
- SIDE CARRIAGE APRON TAPER GIBED TO FRONT BEARING ON BED
- INDEPENDENT FEED RANGES FOR EITHER APRON

This ACME Ram Type Turret Lathe as illustrated is tooled for chucking work. It is also equipped with chasing attachment for cutting from 4 to 32 threads per inch. This attachment is extra and furnished only when required.

This type machine when fitted with automatic chuck and power screw bar feed will accommodate round bar stock up to 2" on the No. 5R machine and up to 2½" round stock on the No. 6R machine.

All of the most important features necessary to maintain accuracy and speed at low cost are incorporated in this design.

For further information contact our engineering department. Write for Bulletin G107A.

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

EDWARD

Blake

COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.

A SPEEDY SOLUTION TO YOUR TAP SHARPENING PROBLEMS

The BLAKE TAP GRINDER

Grinds the *chamfer angle and the relief* on *all the flutes* in one continuous *operation.*

With the Blake Tap Grinder, you can sharpen your dulled taps with *one setup* and in *one continuous operation.* The whole process takes very few minutes and saves you not only the cost of new taps but also keeps your production from bogging down—you won't have to wait for new taps.

The Blake is small, inexpensive and self-contained. It sharpens *accurately* both right- and left-hand taps . . . with 2, 3, 4, 5, 6, 8 or 10 flutes . . . from size No. 0 to 2" dia. It can also be profitably used to sharpen countersinks, 3- and 4-flute drills, step drills and many other tools requiring relief on the point.

Investigate the speedy and profitable Blake method of sharpening taps. Send the coupon today for complete details, without obligation.

Please send me Bulletin No. 544 which describes the Blake Tap Grinder in detail. A.M.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS—HAGER CARBIDE TOOL GRINDERS

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.

CONNEAUT · · · OHIO

UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

Made in 3", 4" and 5" spindle sizes. Write for complete, detailed specifications.

Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.

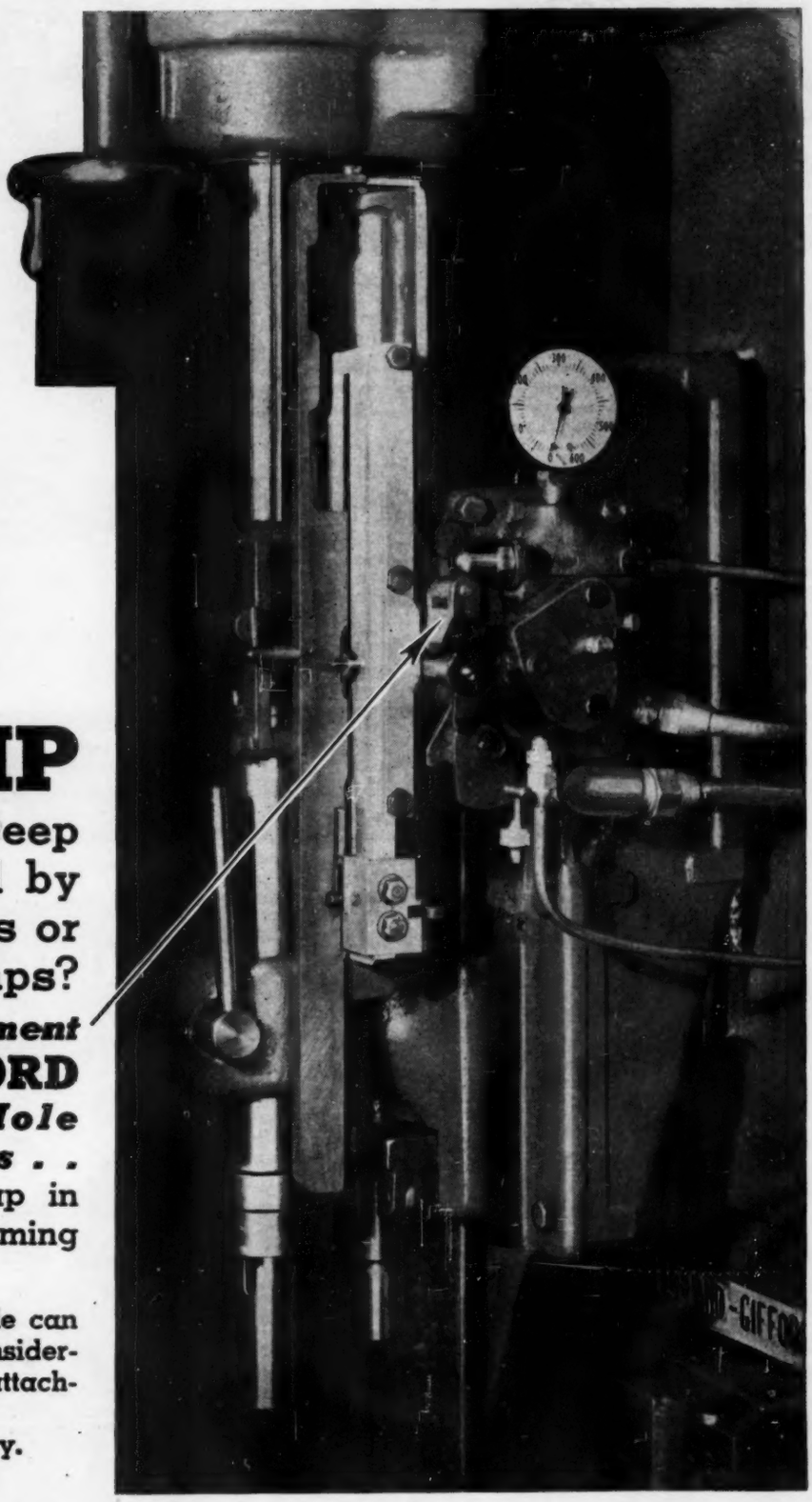
Hudson, Mass., U. S. A.

Promote precision and production with

NICHOLSON EXPANDING MANDRELS

Recognized as standard the world around. Set of 19 does the work of 209 solid arbors. For all bores, ½" to 7". Request Bulletin 1043.

W. H. NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.



GAP JUMP

Are some of your Deep Holes interrupted by Large Cross Holes or or other types of gaps?

The *Jump Gap Attachment* on LELAND-GIFFORD *Hydraulic Deep Hole Drilling Machines . .* permits crossing this gap in Rapid Traverse, then resuming normal feed rates.

Several gaps in the same hole can be jumped in this manner. Considerable time is saved with this attachment. Why not investigate? Bulletin No. 850A tells the story.

LELAND-GIFFORD

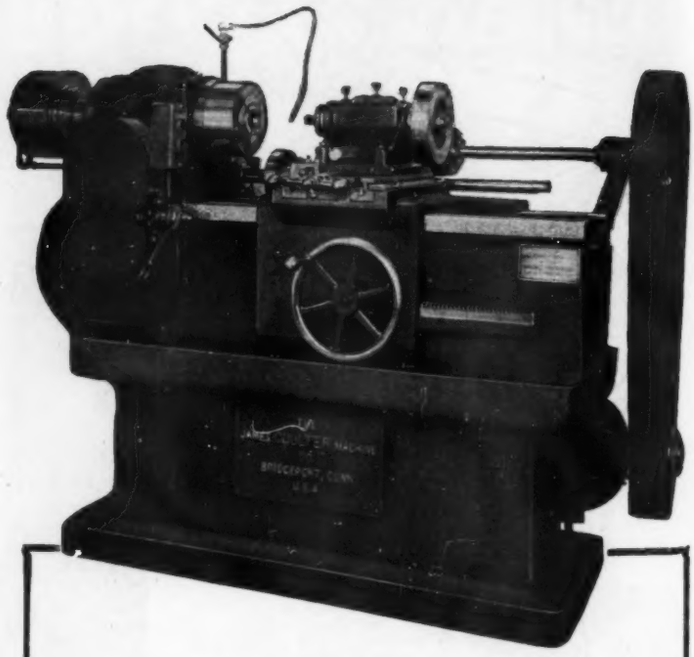
WORCESTER 1, MASSACHUSETTS, U. S. A.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

MOREY *Universal* TURRET LATHES
for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

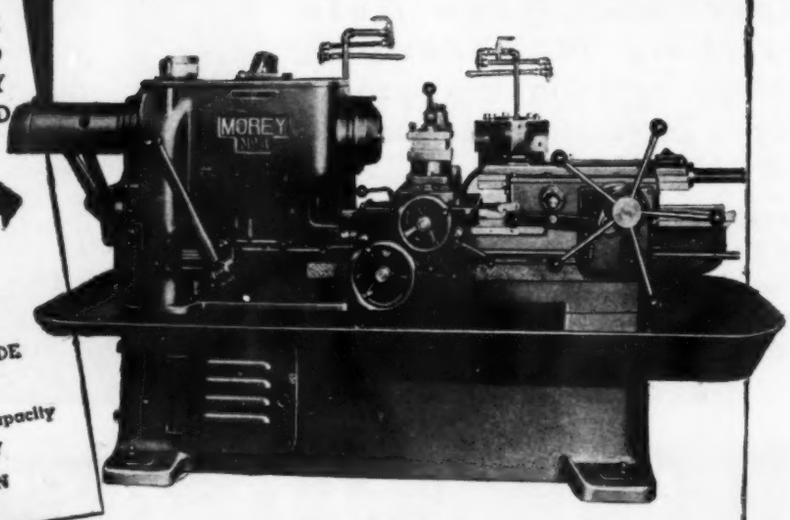
EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length 19½" swing over bed.
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity

ASK FOR DESCRIPTIVE BULLETIN



STOCK DELIVERY

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC 410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

The ABRASIVE No. 1½ Hand Feed Surface Grinder is producing work today—in accuracy, speed and variety—that is as far from the product of the old grindstone as walking is from flying! The ABRASIVE No. 1½ is a versatile machine with unusual capacity for grinding dies, flat work and gauges . . . it combines accuracy with speedy production. Convenient, large handwheels make operation easy; motor built integral with wheel head completely eliminates belts, sprockets and chains . . . minimizes vibration. ABRASIVE design assures years of satisfactory service.

WRITE FOR CATALOG

ABRASIVE

ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL CO, • EAST PROVIDENCE 14, R. I.

The Backbone OF PRODUCTION!

Oliver's ACE CUTTER GRINDER

Correctly ground tools are the answer to profitable production. Use this versatile Tool and Cutter Grinder to keep reamers, end mills, side mills, spot facers, all kinds of special tools and cutters in "like new" condition. It requires only a few simple fixtures to grind all types of tools, producing accurate clearances by direct reading. Oliver-ground tools have uniform teeth, correct angles and cutting edges that mean better results and longer tool service.

Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.
1410 E. Maumee St.
ADRIAN, MICHIGAN

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

NEW! **GOVRO-NELSON UNIT**

MODEL "K"

1. New, free-rolling centrifugal-weight design.
2. Centrifugal mecnanism runs in bath of oil. Seals at motor and spindle retain oil—prevent entry of coolant.
3. Three-point, ball-bearing suspension, for smooth operation.
4. Built-in rate of feed control, to provide slow feed for reaming or rapid movement for other operations.
5. Dwell at end of stroke.
6. Can be operated continuously at 40 operations per minute.
7. Simplified method of reset.
8. Completely automatic with electrical controls.
9. Integral foot for accurate alignment.
10. Machined diameter at nose for special adaptations.

WRITE FOR Literature

GOVRO-NELSON CO.
1933 Antoinette
DETROIT 8, MICH.

Automatic **DRILLING UNIT**

BEFORE YOU BUY A TAPPING MACHINE

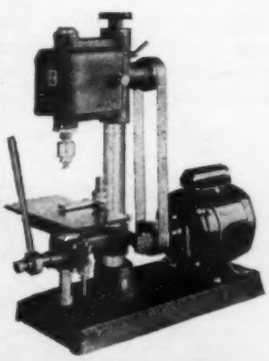
Let's Talk About Tapping!

You've had your troubles with poorly designed tappers, as have we all! Tap breakage; want of adaptability; wrong spindle speeds; limited capacity, and a long procession of wanted features that are **needed** in a tapper if it is to earn its keep.

But have you tried the Hamilton Sensitive Tapping Machine? Here is a machine that literally *feels* its way into the hole while the spindle idles in reverse. A machine that taps to the very bottom of blind holes, reverses direction of rotation and withdraws the tap automatically and *without tap breakage.*

Designed for small hole tapping (from the smallest and finest tap to 10-32 inclusive) it has ample travel and clearances and proper power and speed characteristics for intensive production. And more! It's sensitive and versatile. An ideal tool for the tool room.

Let's talk some more about the matter. Write for descriptive literature and ask us some questions . . . we love 'em. Address Department D-T.



THE *Hamilton* TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS

NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A

DELTA MILWAUKEE

REG. U. S. PAT. OFF.

Cut-Off Machines

. . . for fast, accurate cutting of a wide variety of materials — to exact length, on a production basis

2 Models

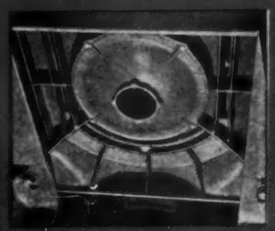
❶ **With abrasive wheel for cutting steel and a wide variety of materials. (Also available with swing guard for cutting wood.)**

❷ **With special steel blade for cutting non-ferrous metals.**

The Delta-Milwaukee Non-Ferrous Cut-Off Machine cuts sharp and clean. Thus, you eliminate the expense of additional finishing operations.

Fence and stop are fully adjustable. Slots in table allow clamping of jigs and fixtures.

Heavy chip guard below table protects operator — collects chips or particles effectively.



Drill Presses

Abrasive

Band Saws

Down go your operating costs, when you use a Delta-Milwaukee Cut-Off Machine. Has wide application on hundreds of operations now being performed by more expensive machines — or being done by hand at high cost. • Speedily and safely cuts such materials as metals, plastics, brake linings, carbon, etc. Makes an exceptionally smooth cut. • Long-life construction features include: Widely-spaced Timken roller bearings in pivot assembly, to assure true wheel travel. Accurately ground and balanced arbor mounted on pre-loaded, lubricated-for-life ball bearings. Dynamically-balanced pulleys. Other famous Delta-Milwaukee features. • You can install Delta-Milwaukee Cut-Off Machines in your plant at a cost that is but a fraction of the usual price for machines of this type. Consult your Delta industrial distributor. Delta sells only through distributors. • Mail coupon for free catalog of low-cost machine tools.

M-16

[Tear out coupon and mail today!]

THE DELTA MANUFACTURING COMPANY
609D E. Vienna Ave., Milwaukee 1, Wisconsin

Send me free copy of catalog describing low-cost Delta-Milwaukee Machine Tools.

Name.....

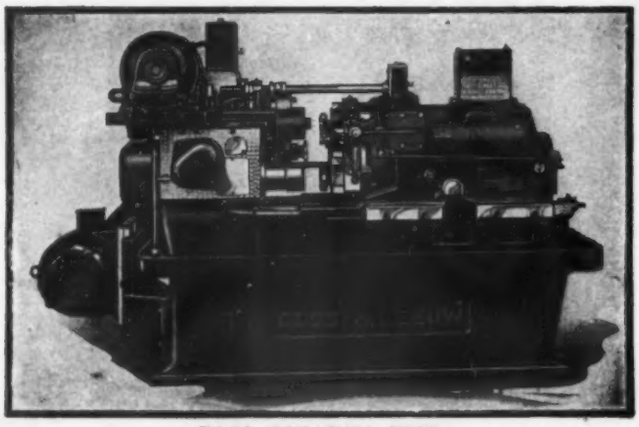
Position.....

Company.....

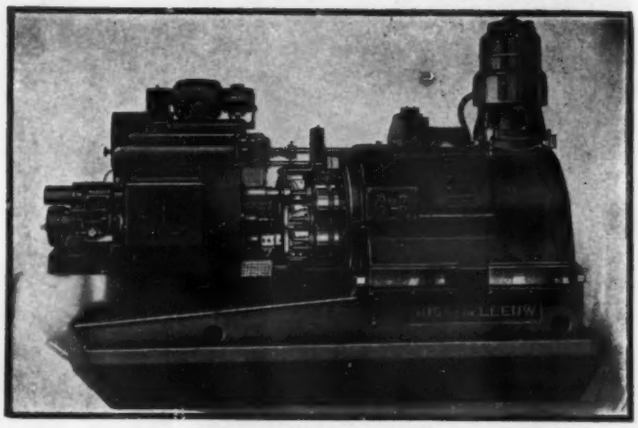
Address.....

City.....(.....) State.....

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES



TOOL ROTATING TYPE
4 Spindles • 5 Chucking Positions

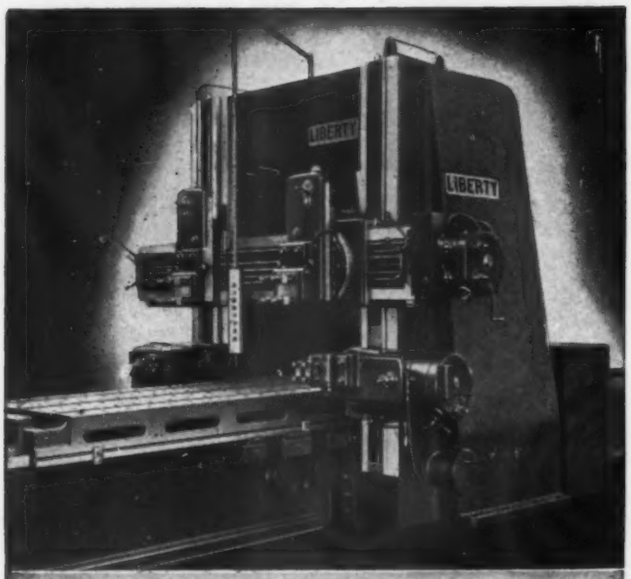


WORK ROTATING TYPE
5 Spindles • 6 Spindles • 8 Spindles

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.



LIBERTY

SMALL, MEDIUM AND HEAVY DUTY

PLANERS

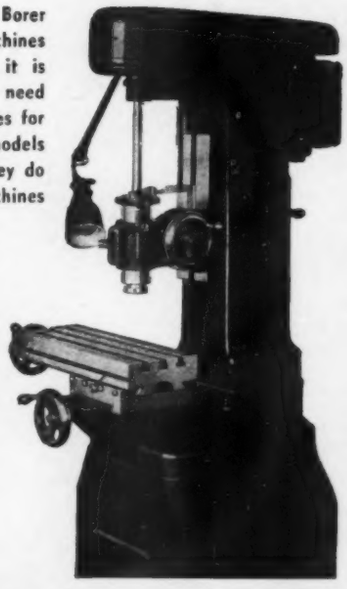
FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.

Over a Quarter Century of Specialized Experience with Time Tested Principles of Design

A TOOL ROOM "MUST" AT MANY PLANTS

The Linley Miller and Jig Borer is on the *preferred* list of machines in many tool rooms because it is fast, accurate, economical. No need to use large, expensive machines for work on dies, jigs, fixtures, models and metal patterns. Let a Linley do it and save higher rated machines for their own jobs.

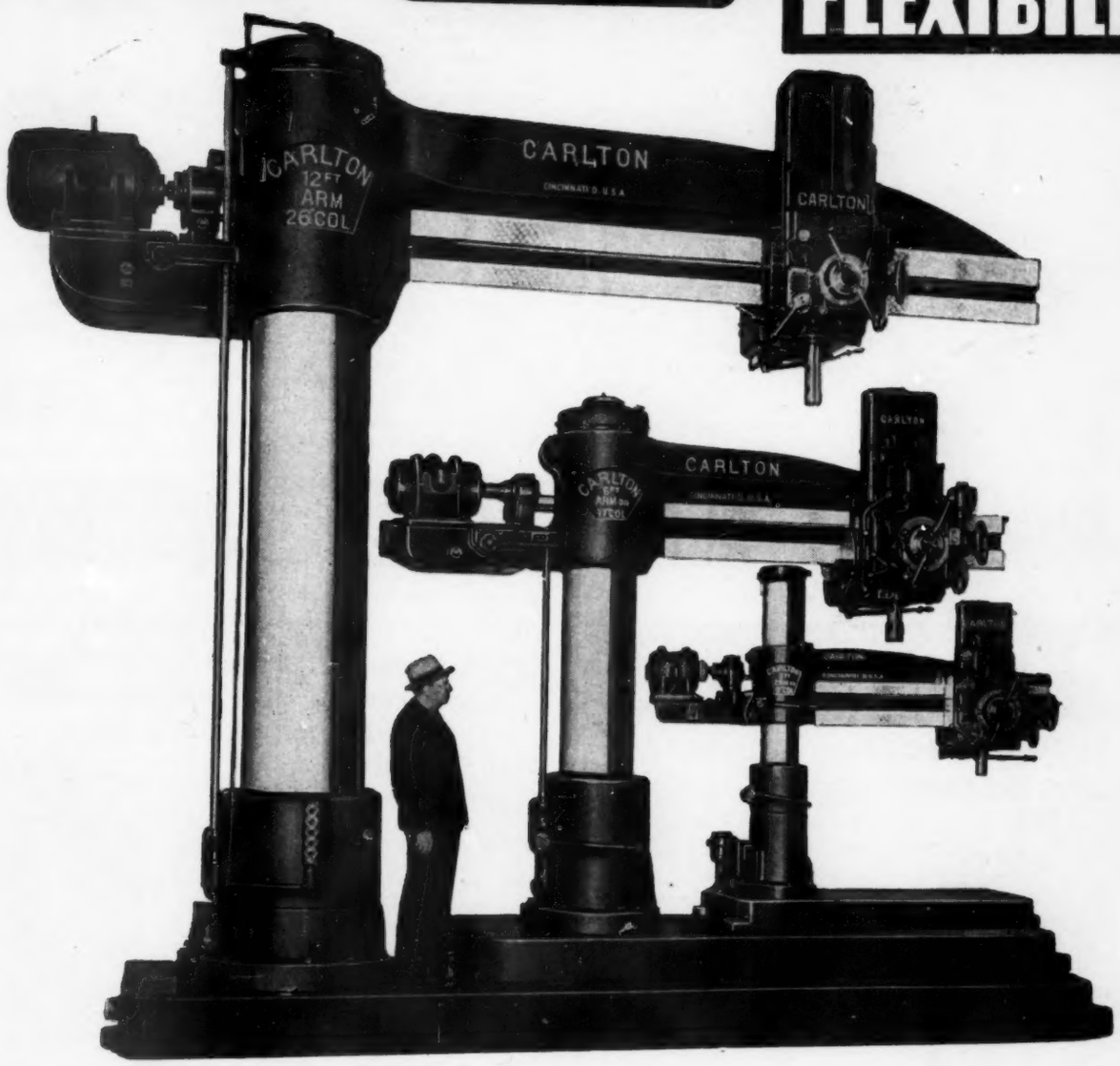


Rapid changeover and quick setup permit versatility in milling, boring and reaming. It has 8 spindle speeds to 4250 r.p.m., direct micrometer setting and velvet-smooth feed. Table size (7" x 17½") is ample, fits in 2½ sq. ft. space and operates on ½ h.p. motor.

See Bulletin for Tool Room Economy

LINLEY BROTHERS COMPANY
604 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

Take a look at CARLTON RADIALS *for* POWER ACCURACY FLEXIBILITY



Carlton has a size for every radial drilling need. All Carlton Radials feature the low hung drive to spindle whereby the main driving gears are carried below the arm and power is applied on the largest diameter of the spindle close to the cutting tool.

It is almost thirty years since Carlton brought out the low hung drive and today thousands of these radial drills are being used by leading manufacturers in the production of a vast number of different products.

The above photo illustrates three of the wide range of sizes from the small 9" column with 3' arm to the 26" column with 12' arm. The full range includes sizes in column diameters of 9", 11", 13", 15", 17", 19", 22", 26" with arm lengths of 3', 4', 5', 6', 7', 8', 9', 10', 11', and 12'. Furnished with all types of bases, standard base, right angle base, double end base, three way base, four way base, half round and round base to enable loading base while operator is drilling. Also furnished with either plain box or universal tables.

Low hung drive to spindle—anti-friction bearings throughout—centralized controls—unit construction—oiling required every six months—all drive parts running in oil—power rapid traverse to head and electro hydraulic column lock are construction features helping to produce more work, faster at lower cost.

Consult Carlton on your radial drilling operations. Representatives in all large cities.

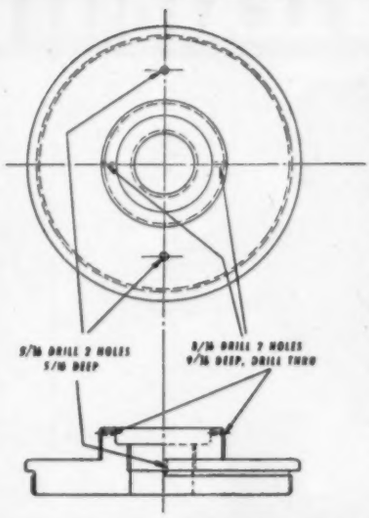
THE CARLTON MACHINE TOOL COMPANY

Manufacturers of RADIAL DRILLS *Exclusively*

CINCINNATI 25 OHIO U. S. A.

HOEFER 3-Way DRILLING HEAD

MULTIPLIES CAPACITY OF PRESENT MACHINES IN PRODUCING BASE PLUGS FOR BOMBS

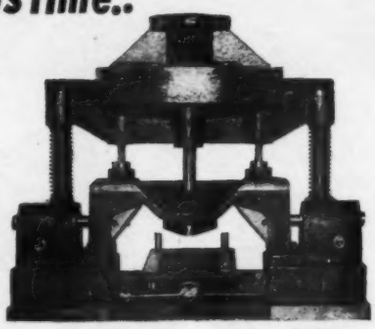


The main or 2-spindle head is driven by the drill press and has two splined drivers near its outer rim which, through bevel gears, drive the two horizontal spindles.

The feeding of all four drills—two vertical and two opposed horizontals—is accomplished by rock and pinion which are covered by the guards shown.

Instead of handling the drilling of the base plug for the four holes from three different directions, one pass of the driller spindle drills all four holes in 1/5 the previous time. Actual drilling time 6 seconds.

ONE PASS of the driller spindle drills all 4 holes in one-fifth the previous time..



Hoefer Multiple Spindle Heads not only increase production per hour but decrease drilling cost per piece. In addition, they increase production from the same floor space, decrease handling time, and lessen operator fatigue. Through use of these drill heads you release needed machines for other work.

★ The use of Hoefer Multiple Spindle Heads on your present equipment will take care of any drilling requirement. When a part becomes obsolete because of re-design, you have only the inexpensive base or support on which the unit is mounted to discard—not the whole machine. Hoefer Heads were designed to meet the need for maximum flexibility and they do it efficiently and economically. Give us an opportunity to analyze your drilling problems—send us your blueprints and number of parts you need for one day. We can design a head that will speed your production, save handling time, and save the need for new costly drilling equipment.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

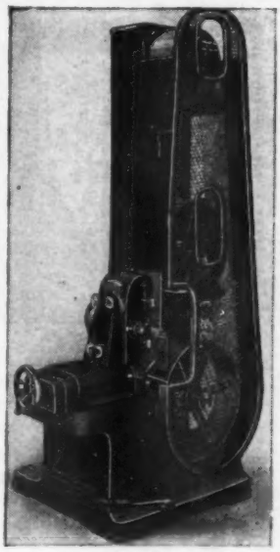
PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

High Speed, High Quality FINISHING *is assured by the* "PRODUCTION" *Type A Centerless Feed Machine for* CYLINDRICAL *or* FLAT WORK



"PRODUCTION'S" most recent development in high speed polishing employs the Duplex Patent Two-Belt Process. This system comprises an abrasive belt running over a patent cushion leather belt, a combination providing high points for cutting and low points for chip clearance. As a result, this machine can be depended on for both high speed and high quality finishing.

Specifications

Capacity: With power attachment, round stock from ¼" to 6" diameter. For hand work, anything within range of belt and holding ability of operator.

Speeds: Driving pulley 1200 R.P.M.; leather cushion belt, 6300" per min.

Send for illustrated literature giving complete information.

PRODUCTION MACHINE CO.
Manufacturers of Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

IF YOUR AIM IS *Accuracy...*

● Put the job on Kent-Owens Milling Machines... to get utmost *accuracy* in top-speed production! Your experienced operators will like the simple, efficient, practical operation of these machines. Ruggedly built... with a long record of unbeatable dependability. Adaptable to a wide range of work. Illustrated is the Kent-Owens 2-20 Milling Machine. Other models include the 1-14, 1-8, 1-V, 2-20V, 1-14V, 2-20DS, 1-14DS, 1-M and 2-RV. Write for latest bulletins. Kent-Owens Machine Company, Toledo, Ohio.

Specify KENT-OWENS *Milling Machines*

No. 2-20 Milling Machine Table, 42" by 12" Table travel, 20"

KENT-OWENS REPRESENTATIVES

BOSTON — General Machinery Corp.
BUFFALO — Don W. Patterson
CHICAGO — Neff, Kohlbusch & Bissell
DALLAS — Hamilton-Hunter Mach'y Co.
DAYTON — Geiger Mach'y Company
DETROIT — A. C. Haberkorn Mach'y Co.
GRAND RAPIDS — Joseph Monahan
HOUSTON — Oliver H. Van Horn Co., Inc.
INDIANAPOLIS — Ostis-Booth Machinery Co.
KANSAS CITY — Eichman Machinery Co.
LOS ANGELES — Eccles & Davies Mach'y Co.
MILWAUKEE — Neff, Kohlbusch & Bissell
MINNEAPOLIS — The Batterlee Company
MOLINE — John J. Normoyle Co.
MONTREAL — F. F. Barber Mach'y Co.
NEW ORLEANS — Oliver H. Van Horn Co., Inc.
NEW YORK — Harrington-Wilson-Brown Company
PHILADELPHIA — Calco Machinery Company
PITTSBURGH — Barney Machinery Company
ROCHESTER — F. W. Schiefer Machinery Co.
SAN FRANCISCO — C. F. Buloni Machinery Co.
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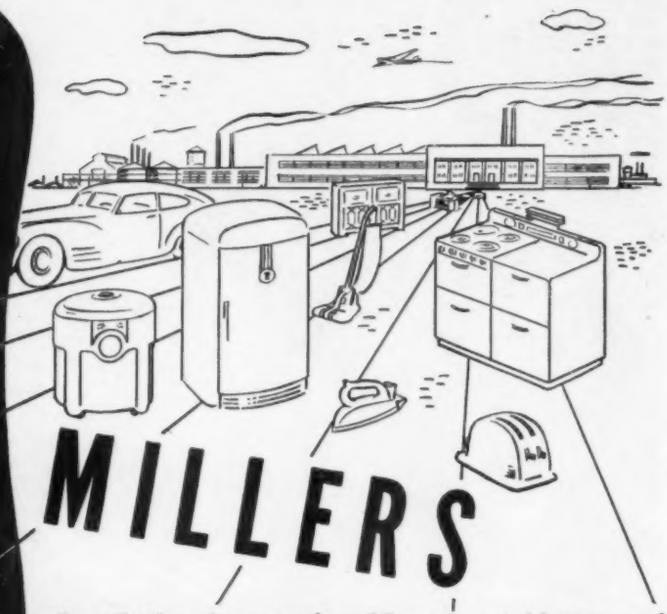
TORONTO — F. F. Barber Mach'y Company
WALKERVILLE — F. F. Barber Mach'y Company

MORE GOODS FOR MORE PEOPLE AT LOWER COST

with KNIGHT MILLERS



Contributing, for more than 35 years, notable time and dollar economies in the production of more and better goods, these features, engineered and built into Knight Millers, offer you exceptional opportunities to increase output and reduce cost:

Adaptability... to a wide range of difficult or out-of-the-ordinary work enables Knight Millers to perform jobs that often require two or more machines.

Flexibility... Knight's tilting, swiveling table is universal in scope, and eliminates the use of costly special jigs and fixtures.

Capacity... Increased working area, and the use of an unusual range of cutter sizes, are provided by sixteen changes of spindle and table speeds and feeds, four vertical spindle feeds, and the swiveling table.

Speed... Reduced setup time, elimination of special setups, fast changing of cutting tools, quick locating, all mean sizeable economies in time.

Accuracy... Sturdy one-piece reinforced column, wide and accurate bearing surfaces, precision gearing and rigid supports, insure accuracy, smooth operation and rugged service.

Learn how Knight Millers can help you produce more goods for more people at lower cost.

WRITE TODAY FOR COMPLETE CATALOG

KNIGHT VERSATILE MILLERS ACCURATE RIGID

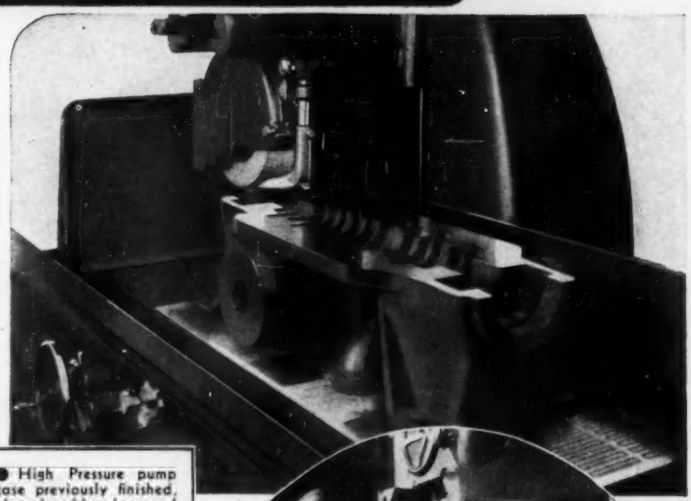
W. B. KNIGHT MACHINERY COMPANY

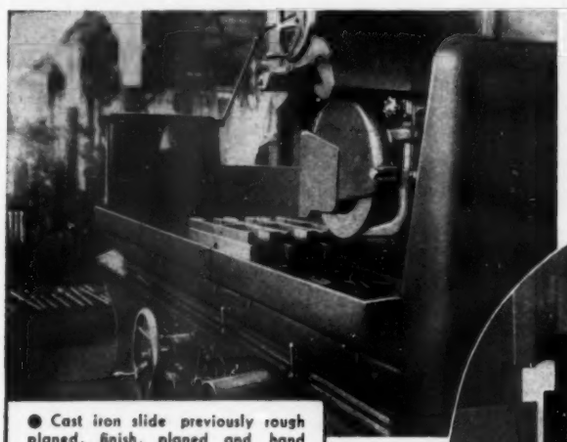
3920 WEST PINE BLVD. • ST. LOUIS 8, MISSOURI

MATTISON GRINDER
Cuts time up to 75%
ON JOBS PREVIOUSLY HAND SCRAPED

Examples: Time on pump case reduced from 40 hours to 4 hours . . . . . Time cut from 12 hours to 3½ hours on slide castings . . . . . Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this make a big difference in manufacturing cost. To see what Mattison High-Powered, Precision Surface Grinders can do on your work, send us blue prints for production estimates.

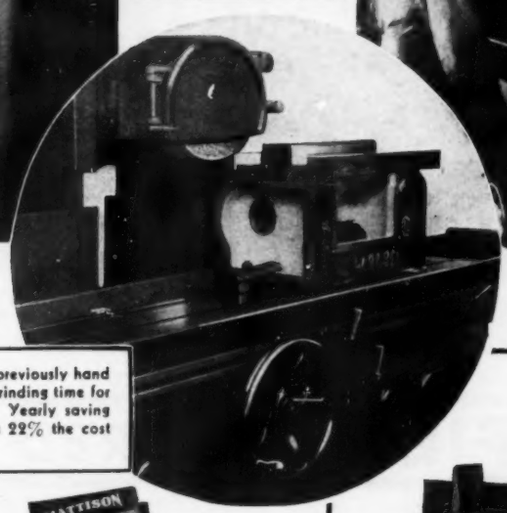




● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 80% savings in time. Finish planing and scraping operations eliminated.

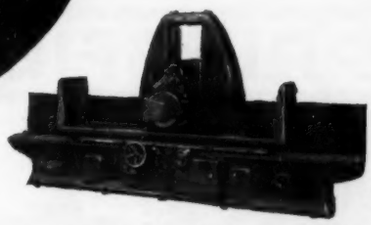
● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".

● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.

Write for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.



Mattison High Powered Precision Surface Grinder. Table Sizes: 12" to 36" wide, 36" to 192" long.

MATTISON MACHINE WORKS

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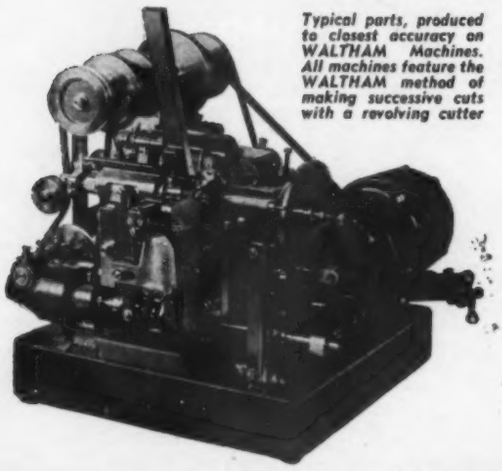
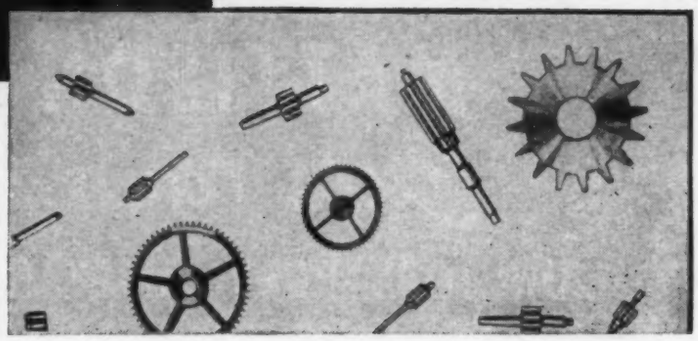
WALTHAM
PINION & GEAR CUTTING MACHINES

for precision production of fine pitch mechanisms



Typical parts, produced to closest accuracy on WALTHAM Machines. All machines feature the WALTHAM method of making successive cuts with a revolving cutter



Single-Cut Pinion Machines This machine employs one cutter. Blank is positioned and machine started by hand, all other movements being automatic.

Multiple-Cut Pinion Machines Two or three cutters on arbor of cutter spindle make successive cuts. Machine stops on completion of last cut.

Magazine-Fed Pinion Machines Provides continuous production of one kind of pinion. Magazine is loaded and all other operations including cutting and ejecting are automatic and continuous.

Gear Cutting Machines Single and Multiple cut machines equipped with special cutter swing provide the means of cutting teeth on gears up to 1½" pitch diameter and in a stack ¾" to 1" long.

Write for literature giving detailed specifications

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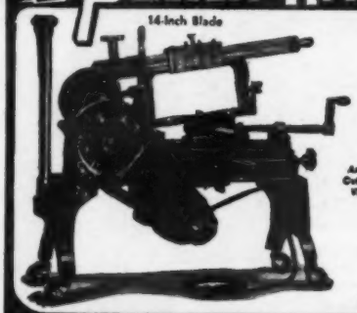

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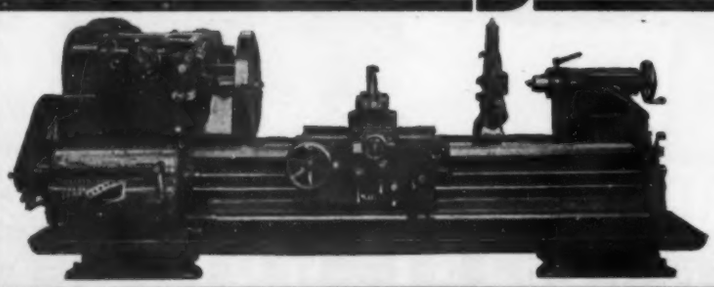

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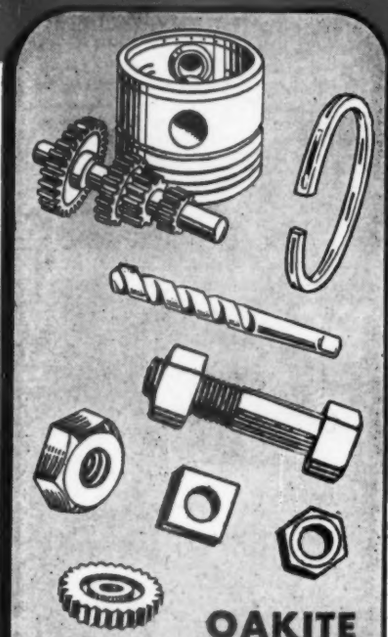

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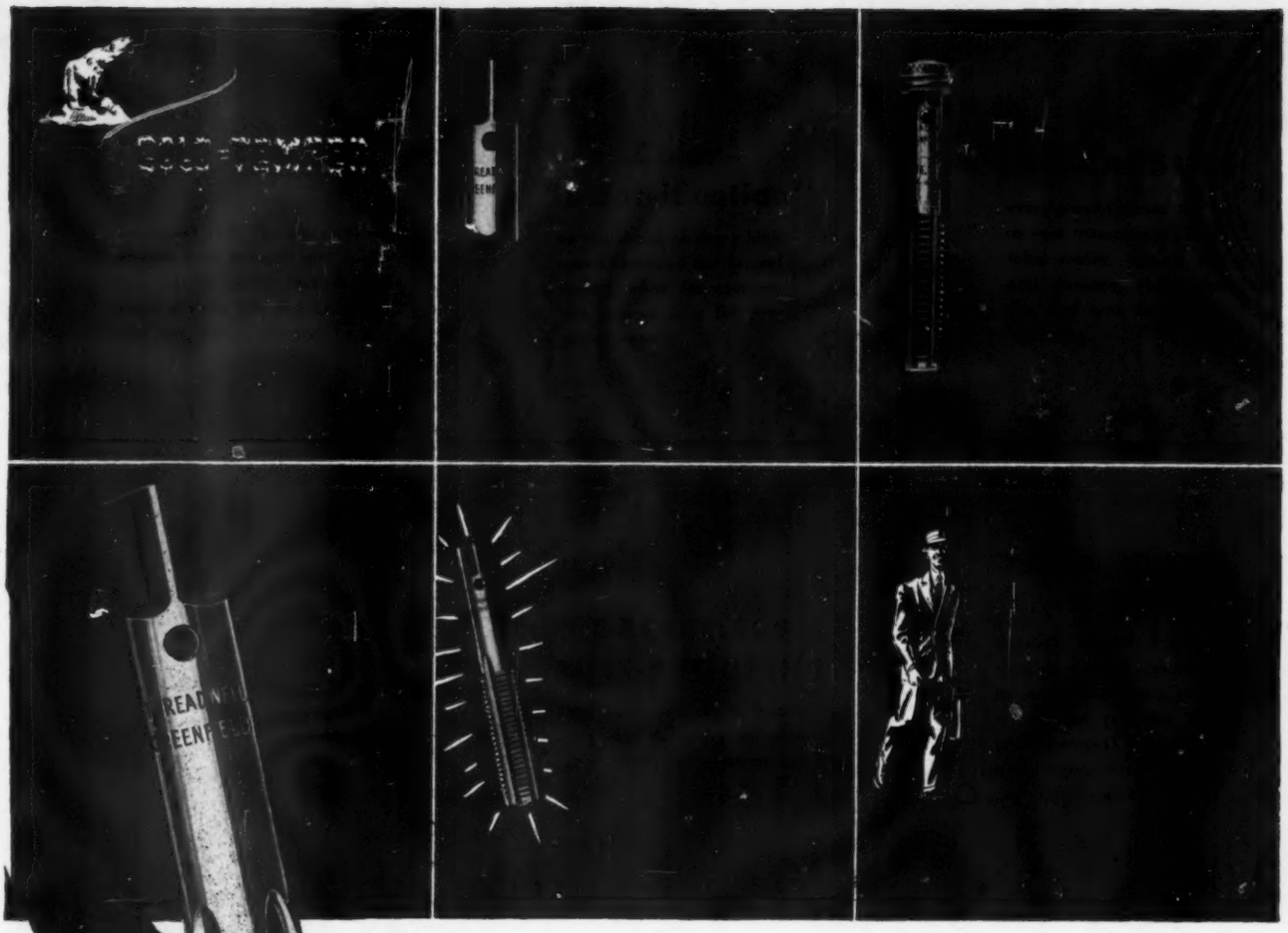

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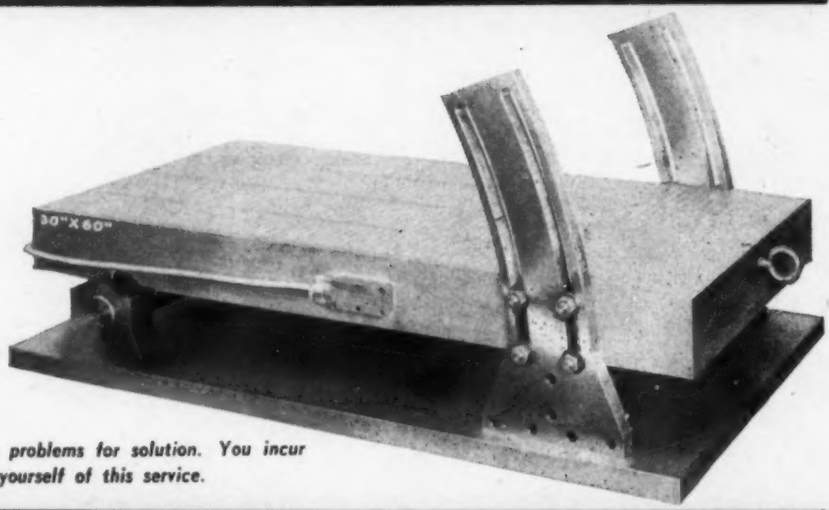

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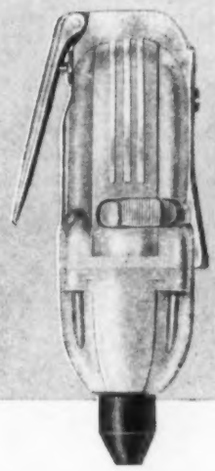

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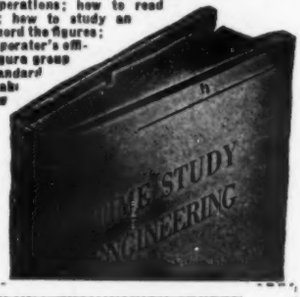

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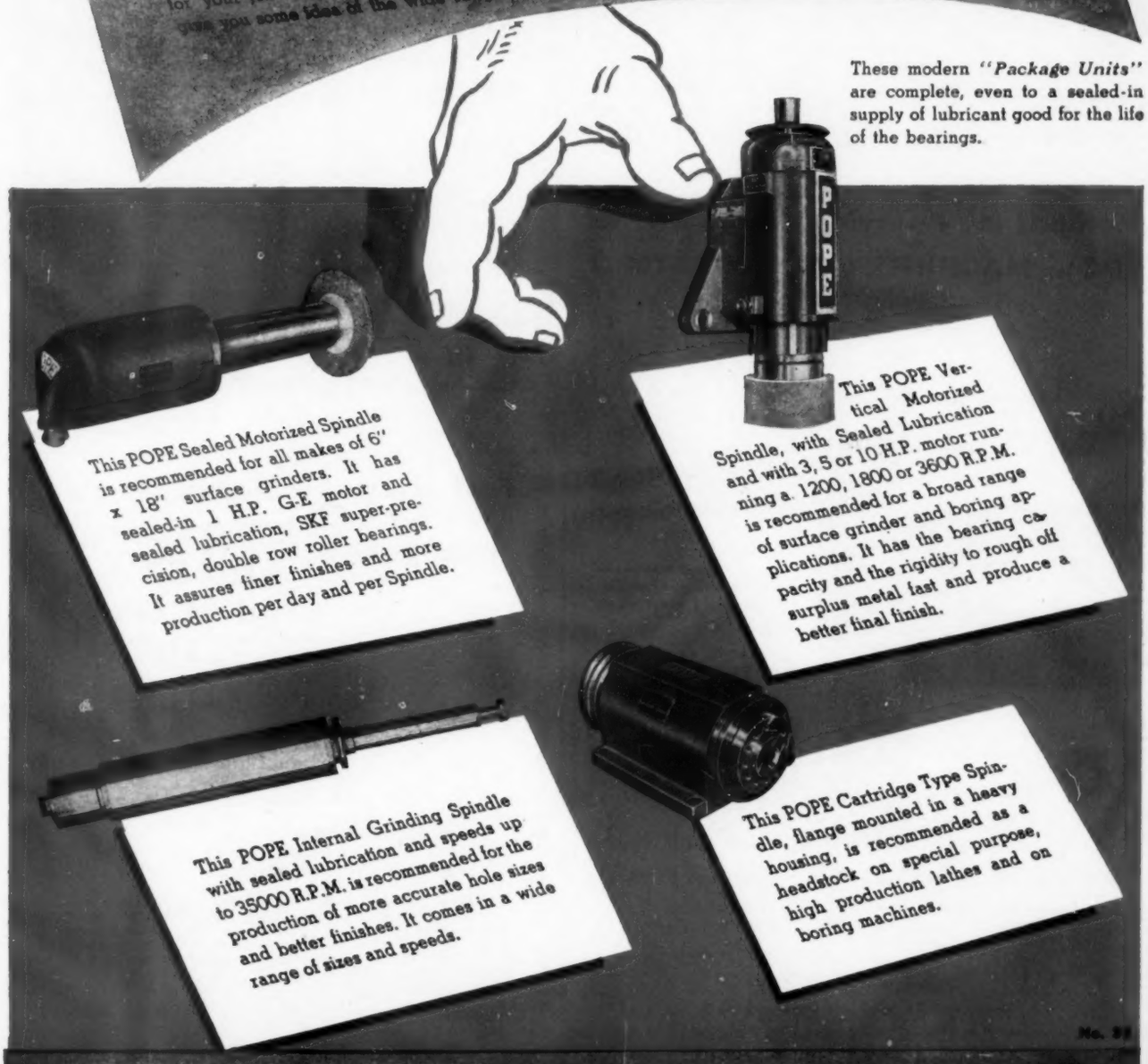


These modern *"Package Units"* are complete, even to a sealed-in supply of lubricant good for the life of the bearings.

This POPE Sealed Motorized Spindle is recommended for all makes of 6" x 18" surface grinders. It has sealed-in 1 H.P. G-E motor and sealed lubrication, SKF super-precision, double row roller bearings. It assures finer finishes and more production per day and per Spindle.

This POPE Vertical Motorized Spindle, with Sealed Lubrication and with 3, 5 or 10 H.P. motor running a. 1200, 1800 or 3600 R.P.M. is recommended for a broad range of surface grinder and boring applications. It has the bearing capacity and the rigidity to rough off surplus metal fast and produce a better final finish.

This POPE Internal Grinding Spindle with sealed lubrication and speeds up to 35000 R.P.M. is recommended for the production of more accurate hole sizes and better finishes. It comes in a wide range of sizes and speeds.

This POPE Cartridge Type Spindle, flange mounted in a heavy housing, is recommended as a headstock on special purpose, high production lathes and on boring machines.

No. 31

POPE

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

Spare Parts for Famous LVT Water Buffalo

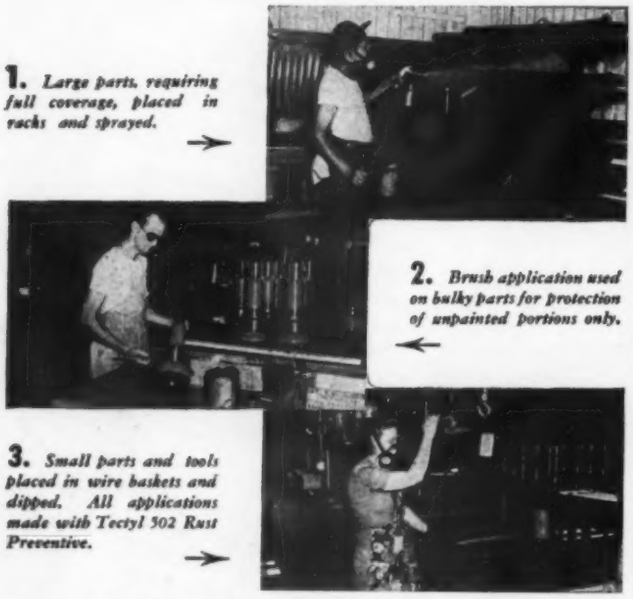
RUST-PROOFED WITH TECTYL

Water Buffalo—Amphibious Tank—Official U. S. Navy Photo

Assigned to handle the packing and shipment of spare parts for the entire LVT program, the Food Machinery Corporation, Riverside Division, chose Tectyl 502 for the vital job of rust prevention. Despite the hazards of overseas shipment — Tectyl brought those parts through in perfect condition.

Methods of Applying TECTYL at FOOD MACHINERY CORPORATION

Riverside Division—Riverside, Calif.



1. *Large parts, requiring full coverage, placed in racks and sprayed.*

2. *Brush application used on bulky parts for protection of unpainted portions only.*

3. *Small parts and tools placed in wire baskets and dipped. All applications made with Tectyl 502 Rust Preventive.*

There's a Tectyl Solution for Every Rust Problem

For specific recommendations on the use of Tectyl in your plant, write or wire, giving details of your products and types of exposure encountered.

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TECTYL

ENDS RUST

FREEDOM-VALVOLINE OIL COMPANY

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*Mastercased** TO GIVE UP TO

500% LONGER LIFE

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HIGH-SPEED *Mastercased CUTTING TOOLS

Meet the Challenge

**Mastercasing...*

That's our improved super-heat-treating process which adds to the life of Masterform cutting tools...will multiply your production...will divide your costs per cut.

Want proof? Write, wire or phone for name of nearest-to-you factory representative..or without the slightest obligation, send specifications for estimates and complete information.

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OUTSTANDING ENGINEERING SERVICE AND CRAFTSMANSHIP

Fast Accurate Measurements

with the NEW AMIC

Quick Action

VERNIER CALIPER

Size 6"

THE PERFECT TOOL for machine shop, garage, repair shop, aircraft-maintenance, etc.

A flick of the thumb and you've got your external and internal dimensions. Knife-edged jaws provide exact thread measurements. A depth gage blade gives speedy depth measurements. Made of stainless steel or toolsteel; packed in a sturdy leather case. Scientifically engineered, painstakingly machined and American made, the AMIC Quick Action Caliper is a quality tool without a rival.

Gradations in English—1/32" or 1/40"; in Metric—full mm. Reading on Vernier 1/128" or 1/1000" and 1/10 mm.

Also AMIC Precision Vernier Calipers, Height Gages, Depth Gages, Pocket Calipers, Comparators, Precision Graduated Metal Scales.

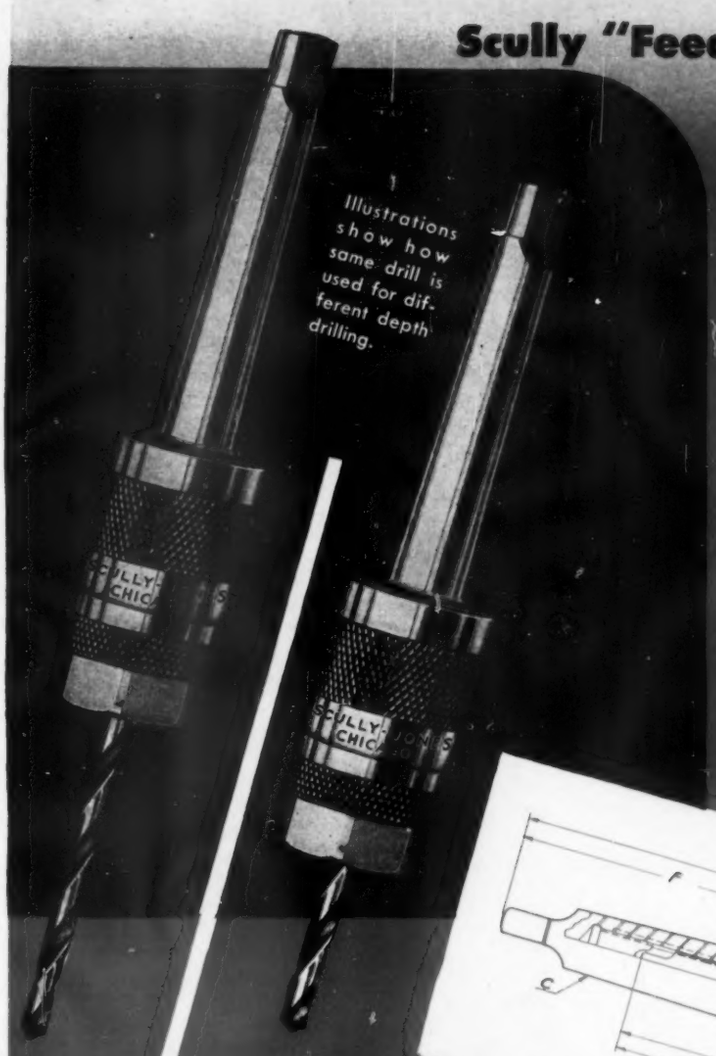
Write for FREE Booklet D and price list or telephone PEnnsylvania 6-0687

AMERICAN MEASURING INSTRUMENTS CORP.

240 WEST 40th ST. • NEW YORK 18, N. Y.

The "LONG and SHORT" of It

Scully "Feed as you Need" Chucks

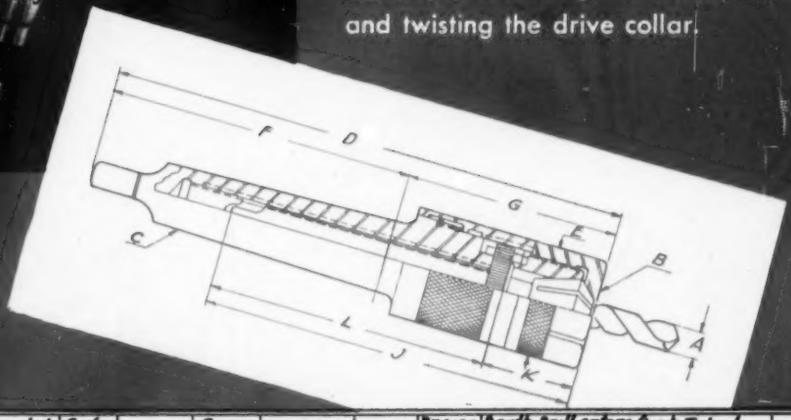


Illustrations show how same drill is used for different depth drilling.

WITH Scully "Feed as you Need" Chucks, you can chuck short or long series drills with only a small portion of the drill extending—thus keeping overhang at a minimum. The drill always has a positive backing against slipping into the chuck.

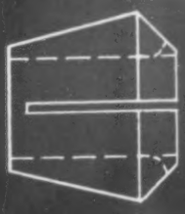
You need only half as many drills when you use Long-Series Drills for Short-Series work. The saving in Time and Tools is apparent.

The drill is adjusted for depth or overhang without releasing the chuck, by simply loosening the Collet lock nut and twisting the drive collar.



Tool Number	To Accommodate Inclusive Drill sizes	Collet No	M.T. Shank	Over-all length	Body Diameter	Shank Depth	Projection from Spindle	Depth Drill enters Chuck when completely Drawn in	Depth Drill enters Chuck when completely Extended	Total Adjustment	Price each
	A	B	C	D	E	F	G	J	K	L	$
NA-1	57 To 11/64	A	1	4 1/4	7/8	2 7/16	1 13/16	2 11/16	13/16	1 7/8	17.00
NB-2	1/8 " 9/32	B	2	5	1 1/16	2 15/16	2 1/16	3 3/8	7/8	2 1/2	21.00
NC-3	3/16 " 13/32	C	3	6 9/16	1 1/2	3 11/16	2 7/8	4 7/16	1 5/16	3 1/8	26.00
ND-4	5/16 " 9/16	D	4	7 15/16	1 7/8	4 5/8	3 5/16	5 1/2	1 5/8	3 7/8	33.00

FURTHER INFORMATION AND QUOTATIONS ON REQUEST



Collet Number	For Drill Sizes	Price each
A	57 TO 11/64	2.25
B	1/8 " 9/32	3.00
C	3/16 " 13/32	4.50
D	5/16 " 9/16	6.00

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

1914 SOUTH ROCKWELL STREET • CHICAGO 8, U. S. A.

A TOUCH...

..swings great weldments into any position

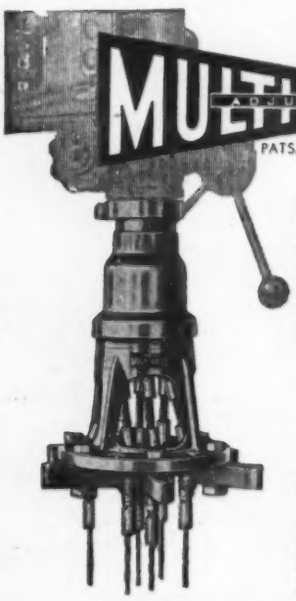
When Weldors can swing tons of weldment into any position for the next downhand pass quickly and safely, with a touch on the push button control, they are able to work better, faster and more economically, no matter what the job. Interruptions in any welding operation are costly—when weldors or their helpers must prop up, flop, turn over, crawl under, over and around a weldment, they are adding costs to the job. Because more and more welding is being done in today's production, it is important that your welding costs and quality be examined in the light of economies and improvements made possible by C-F Positioners.

Not only do C-F Positioners give welders more time for welding by permitting them to swing weldments into the correct position for a downhand pass, they make all welding better and more economical by making possible the use of heavier electrodes, eliminate "overwelding" and waste of power and materials. Write for Bulletin WP-22. CULLEN-FRIESTEDT CO., 1313 S. Kilbourn Ave., Chicago 23, Ill.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

MULTI-DRILL
ADJUSTABLE
PATS. PENDING



Any Hole Pattern

Drill 6 Holes at One Stroke— Adjustable for *any* Pattern!

Your drill presses equipped with adjustable MULTI-DRILL heads will

- Reduce costs thru multiplying your present drill press production
- Conserve valuable floor space in your shop or departments
- Reduce your equipment investment
- Often save their cost on the first job

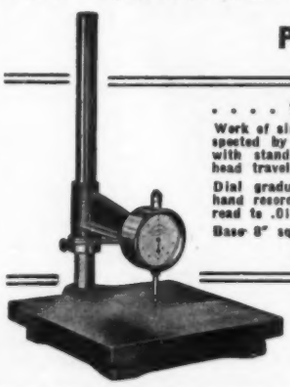
The MULTI-DRILL attaches conveniently to most ½" drill presses. Its six radially adjustable spindles are quickly set to any hole pattern within 5" circle—11/16" minimum centers. Standard capacity 3/32" to 17/64" drills. Many modifications are available for your special applications at slight additional cost.

Write today for circular.

COMMANDER MFG. CO.

4229 Kinzie St., Chicago, U.S.A.

The RANDALL & STICKNEY Platform Gauge



. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

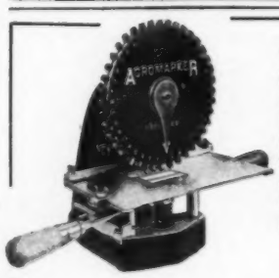
Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!

FRANK E. RANDALL CO.

Waltham 54, Mass.



The ACROMARKER is a remarkably easy-to-operate marking machine offering faster, more accurate marking than heretofore possible. Widely used in industry, this model weighs only 30 lbs. It stamps letters and figures in straight or curved lines. With it unskilled help can do the work of skilled men faster and accurately.

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The **ACROMARK** *Company*

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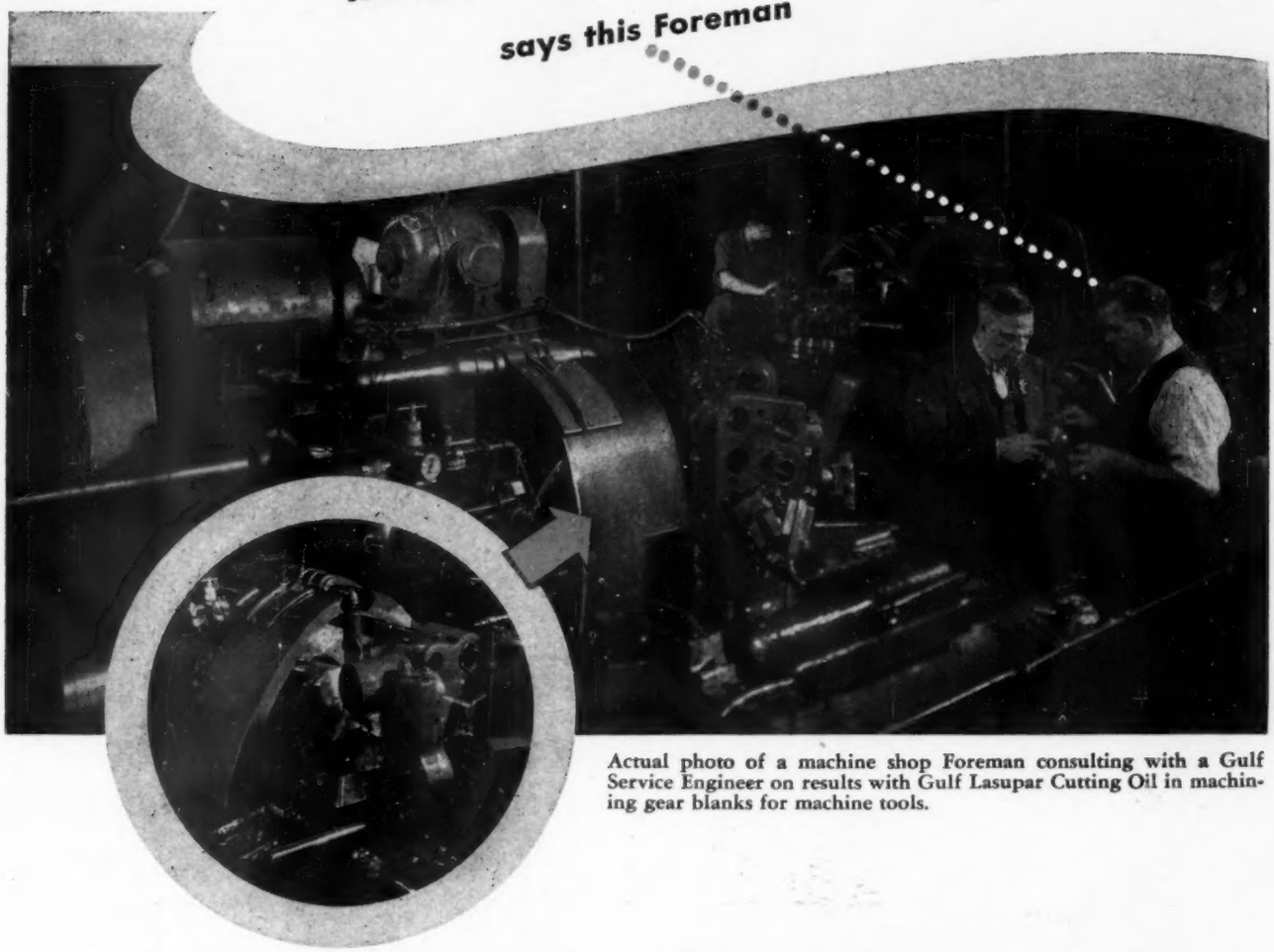
"With GULF LASUPAR CUTTING OIL we get more production, longer tool life"

says this Foreman



Actual photo of a machine shop Foreman consulting with a Gulf Service Engineer on results with Gulf Lasupar Cutting Oil in machining gear blanks for machine tools.

"GULF LASUPAR CUTTING OIL has proved superior to all other cutting oils we have tried for machining gear blanks," says this Foreman. "With this quality cutting oil, we get greater production and much longer tool life than with the cutting fluid we formerly used."

Here's a cutting oil that can help your machines gain an edge in performance—mighty important for the period of keen competition just ahead! Gulf Lasupar Cutting Oil has the combination of characteristics needed to handle the modern steels. It works well at speeds once thought impossibly high. It cuts machining costs — often improves production as much as 50 per cent, and meets requirements for an exceptionally fine finish on the work.

Call in a Gulf Service Engineer today and let him demonstrate how this cutting oil can help you improve your machining practice. Gulf Lasupar Cutting Oil—and the other quality cutting oils in Gulf's complete line—are available to you through 1200 warehouses in 30 states from Maine to New Mexico. Write or wire your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

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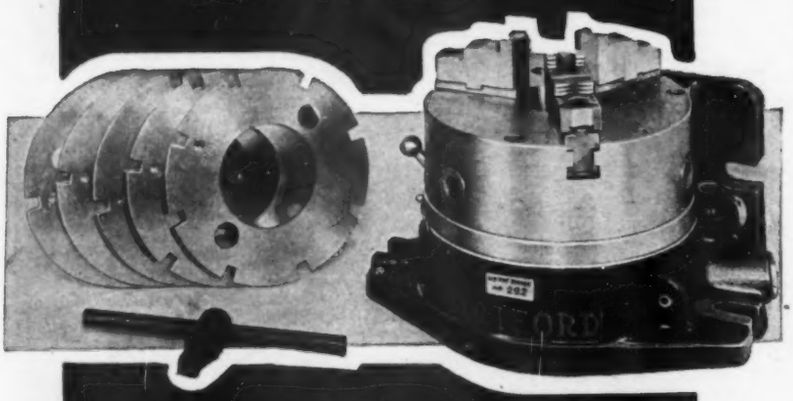
The HARTFORD SUPER-SPACER



has proved its value as a fast, accurate time-saving SPACING-DEVICE

TIME-TESTED under emergency conditions, the "Super-Spacer" has met the test for greater, faster and more accurate production. It has also demonstrated its ability to stand the gaff of long, hard service and to operate with outstanding satisfaction at speeds and feeds limited only by the capacity of the holding means and the power of the machine on which it has been used.

With its attachments and fixtures, the Hartford Super-Spacer is adaptable to milling, drilling, grinding, jig boring, planing and slotting. It has proved itself to be a fast, versatile and accurate spacing device even in the hands of unskilled operators. Mask plates eliminate all chance of error. It is a time saver on single piece work or quantity production.

It will be to your advantage to explore the possibilities of this modern, foolproof indexing device. *Write today for literature showing a few of its many applications.*

The HARTFORD SPECIAL MACHINERY CO.
Hartford 5, Conn.

Here's what we mean by

VISE-GRIP JAW

SPECIFICATIONS
MODEL SIZE TOOL CAPACITY
60 0 1/8 to 5/16
61 1 3/16 to 3/8
62 2 1/4 to 1/2
64 4 5/16 to 5/8
With 15° or parallel cutter channel either left or right hand.

Exclusive in Clark Adjustable Tool Holder

Equalized pressure over *full* length of cutter channel—screw-operated jaw runs right to cutting edge, hugs bit so it can't slip, sag, or break! Takes 4 or more sizes of square, round, short or narrow tool bits. Parallel models for carbide bits, threading tools and boring bars.

Call your Clark Cutter Jobber today, or write for catalog A.M. 4 TH

CLARK CUTTERS

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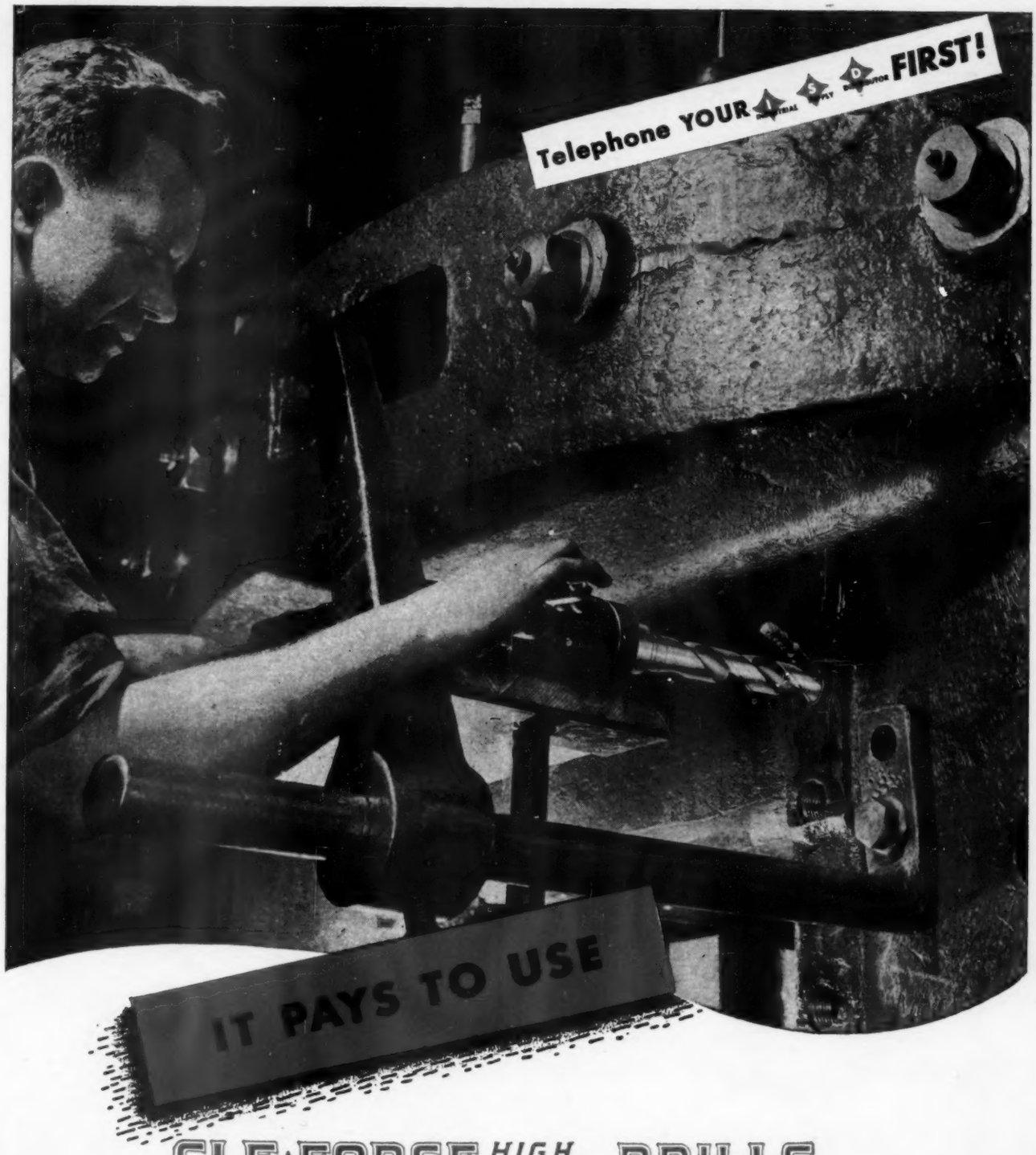

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on special set-ups

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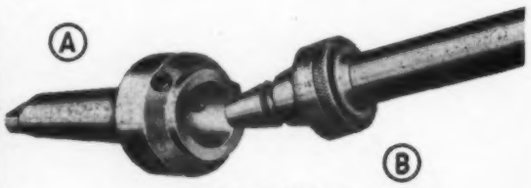
Big Saving in Set-up Time with

DIALSET

micrometric adjustment

It's easy to adjust the DIALSET Boring Tool *on the job* to a half-thousandth after one trial cut. In fact, you can adjust to even closer tolerances by reading between the lines on the scale. And that saves a lot of set-up time on precision boring!



HOW IT WORKS

The socket in the adapter (A) accommodates the cone on the insert (B). Both socket and cone are eccentric. When the three setscrews are loosened, the insert can be turned to any reading desired on the dial. Each graduation indicates a change of .0005" in the boring diameter. A full adjustment of .025" can be made. Tightening the setscrews holds the insert in the adapter so firmly that the DIALSET Tool has the rigidity of a one-piece boring bar.

The DIALSET line comprises three groups of tools. The "A" series consists of an adapter and four inserts with minimum cutting diameters ranging from 3/8" to 1-1/16"; "B" series, an adapter and five inserts, 1-1/2" to 2-1/2"; "C" series, an adapter and three inserts, 3" to 4". Straight and taper shanks and standard. Special DIALSETs are made to order.

Mail the coupon or write for bulletin describing and pricing DIALSET Tools. Literature on STATE Four-Cutter Boring Bars and Velsey Black Granite Surface Plates will also be sent if you so indicate.

STATE MANUFACTURING & CONSTRUCTION CO.
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Send complete information on DIALSET Tools; ☐ Four-Cutter Boring Bars; ☐ Velsey Black Granite Surface Plates.

Individual

Company

Street Address

City Zone State

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The combination of your ideas and our ideas mean quality and cost reductions—through finer tools, dies, jigs, etc. Our engineers and tool designers are ready to interpret your plans and carry them through to a practical and successful conclusion.

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BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES

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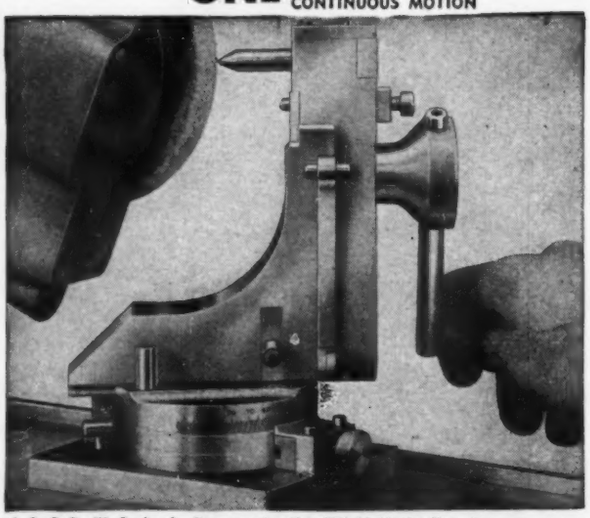
ESTABLISHED 1905

USE

Fluid-motion

for modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION



J & S Radii & Angle Dressers in the "Fluid-Motion" series are among the finest precision dressing instruments procurable. . . . regardless of cost. There is a standard model to fit most form-dressing requirements.

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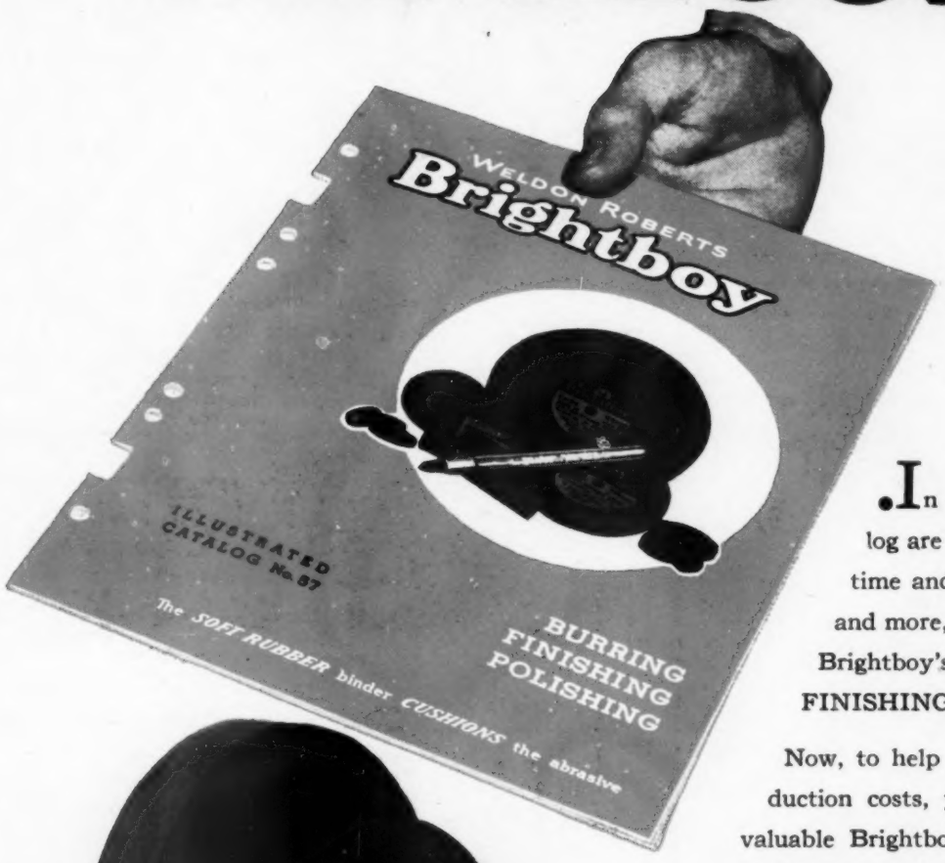
Have a Look at
'THE RECORD'



In this new Brightboy Catalog are records of machine speeds, time and work savings up to 20% and more, through rubber-cushioned Brightboy's simultaneous BURRING, FINISHING and POLISHING.

Now, to help you offset mounting production costs, you should have this invaluable Brightboy catalog, together with Brightboy methods and applications data.

Your dealer will supply you. And Brightboy service men are ready to aid you with production-solution and product-improving recommendations. Write us.

3 Brightboy Textures:
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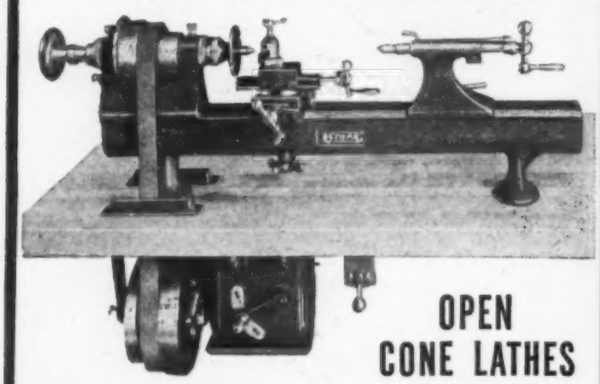
BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co. Newark 7, N. J.

WELDON ROBERTS
Brightboy

Built-in infinitely adjustable drive with any speed at the turn of a convenient handwheel in front. No special bench or cabinet required. 156 to 2200 r.p.m. with Standard (toolroom) model and 220 to 3500 with High Speed (Manufacturing) model. Smooth brake and clutch. Capacity, 3/4" or 1" through headstock; 9" swing, 40" length bed.

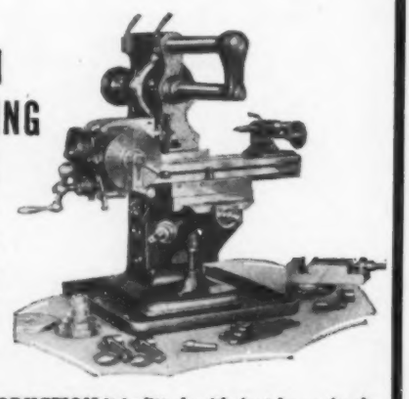
30 PRECISION ATTACHMENTS correctly designed for the very best facility and accuracy are interchangeable with all Starks of the same lathe size



OPEN CONE LATHES

Built in four good sizes, 1/4" x 5 7/8" swing, 1/2" x 7", 3/4" x 9" and 1" x 9" with Stark Motor Drive Unit, the first compact, smooth under-bench drive, with 9 speeds — the full working range.

PRECISION BENCH MILLING MACHINES



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FOR EXACTING PRODUCTION it is fitted with fast lever feeds

Also "ELECTROBLAST" Muffle Furnaces

Gas fired. High speed steel temperatures in 20 minutes. Built in two small sizes.

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Stark Tool Company

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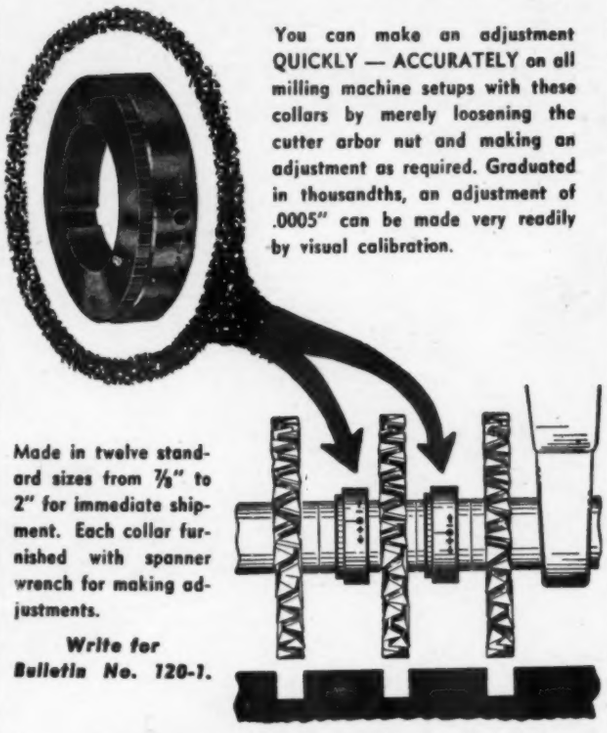
Originators of the American Bench Lathe

MICROMETER ADJUSTMENT

on side milling cutters and gang milling setups with Dayton Rogers Micrometer Adjustable Spacing Collars



You can make an adjustment QUICKLY — ACCURATELY on all milling machine setups with these collars by merely loosening the cutter arbor nut and making an adjustment as required. Graduated in thousandths, an adjustment of .0005" can be made very readily by visual calibration.

Made in twelve standard sizes from 7/8" to 2" for immediate shipment. Each collar furnished with spanner wrench for making adjustments.

Write for Bulletin No. 120-1.

DAYTON ROGERS MANUFACTURING CO.

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INTERCHANGEABILITY

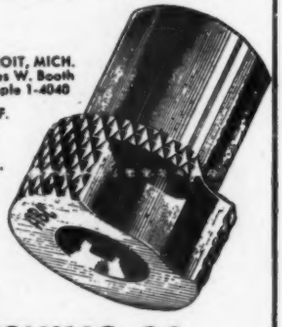
Your KEY to MASS PRODUCTION

Will Speed up Drilling and Lower Costs

A. S. A. STANDARD

PRECISION DRILL JIG BUSHINGS

Standard sizes and styles in stock for prompt delivery. Write for catalog showing table of standard sizes of bushings with price list and other valuable information for the tool designer.



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Absolute Neutrality

TO STEEL SURFACES

with Nu-Sal Neutral Salt Bath

Steel parts are heat treated without carburization, decarburization, or scaling in Park Nu-Sal neutral salt baths. Nu-Sal has long been preferred by leading heat treaters because it is fluid, easy to clean, non-corrosive, and non-hygroscopic. Additions of fresh Nu-Sal are made to replace drag-out only. It is not necessary to make large daily additions of fresh salt to maintain the neutrality of Nu-Sal.

The neutrality of Nu-Sal is easily maintained with small amounts of Nu-Sal Rectifier (Patented). The Rectifier produces a slag by reacting with any impurities in the molten salt. The slag accumulates in the bottom of the pot and is easily removed with a ladle. Park Carbon, a floating carbonaceous cover, is recommended for use with Nu-Sal. Park Carbon reduces fuel costs and discomfort to personnel by cutting down heat radiation from the surface of the bath.

NU-SAL NEUTRAL SALT

Melting Point.....1230° F.
Working Range 1300° to 1650° F.
Wt. per cu. ft.....105 lbs.
200 lb. drums....450 lb. barrels

Hardening of Engine Cylinder Sleeves in Internally Heated Nu-Sal Bath.

● Liquid and Solid Carburizers ● Cyanide, Neutral, and High Speed Steel Salts ● Coke ● Lead Pot Carbon ● Charcoal ● No Carb ● Carbon Preventer ● Quenching and Tempering Oils ● Drawing Salts ● Metal Cleaners ● Kold-Grip Polishing Wheel Cement.

LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Weybridge Surrey, England

Park
CHEMICAL COMPANY
8074 Military Ave., Detroit 4, Mich.

Carbon * and Carbon-Vanadium Tool Steels

Quality	Carbon	Carbon-Vanadium
Special	COLONIAL No. 14	COLONIAL No. 7
Extra	EXTRA L	ELVANDI
Standard	RED STAR TOC1	RED STAR VANADIUM

THESE Special, Extra and Standard QUALITY Tool Steels are made for economical selection according to end use. The advice of our Sales and Metallurgical Departments is yours for the asking.

Available in billets, bars, regular or special hot rolled or cold drawn shapes, plate, sheet, circles, solid forgings, ring forgings and drill rod.

** One of the series of six Vasco Tool Steel Classifications covering every industrial requirement.*

VANADIUM-ALLOYS STEEL COMPANY

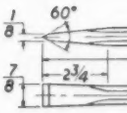
First Quality Tool Steels

Latrobe, Pennsylvania

COLONIAL STEEL DIVISION . . . ANCHOR DRAWN STEEL CO

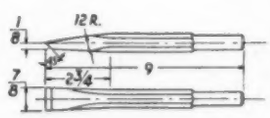
47 SIZES AND STYLES OF CLECO CHIPPERS

No. 3 WA Chipper with ratchet lock handle.

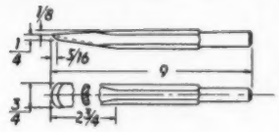


FLAT OR COLD CHISEL
Additional Lengths 12, 18, 24

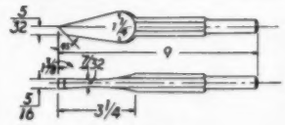
JUST A *FEW* OF THE MANY HELPFUL CHISEL DRAWINGS IN BULLETIN 75B



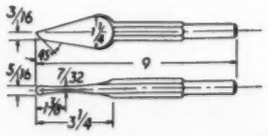
SIDE CUTTING CHISEL
Additional Lengths 12, 18, 24



GOUGE
Additional Lengths 12, 18, 24



CAPE CHISEL
Additional Lengths 12, 18, 24



ROUND NOSE CHISEL
Additional Lengths 12, 18, 24

Send for Bulletin 75B, FULLY DESCRIBING THE MANY TYPES OF CLECO CHIPPERS

• In this large, varied line you will find the *exact* tool for *every* chipping, calking, beading, and scaling requirement. Either the open or closed style of handle may be had, and, for the open type, you have a choice of either a bolt or a ratchet locking device. There is also a choice of two valve mechanisms, both efficient and practically breakage-proof.

Cleco Chippers use a throttle valve that graduates the air supply, thus giving a smooth start to the piston, minimizing recoil and making the hammer easy to hold and control on the work. Furthermore, Cleco Chippers "stand the gaff" because they are extra-tough. Plungers and chisel bushings are made of hardened and tempered tool steel, ground to close limits. The cylinders are made of selected alloy steels, carefully heat treated to insure super strength.

THE CLEVELAND PNEUMATIC TOOL COMPANY
3781 EAST 77TH STREET — CLEVELAND 5, OHIO
BRANCH OFFICES IN ALL PRINCIPAL CITIES

Announcing the

SCHNEIBLE VELOCITRAP

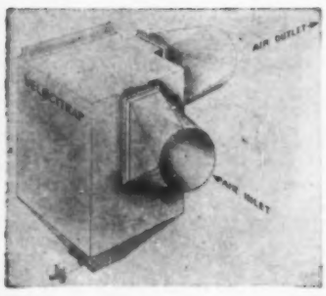
IT DOES THESE 4 THINGS

- ✓ *Salvages Valuable Material*
- ✓ *Recovers Material Dry*
- ✓ *Stops Settling Out of Heavy Material*
- ✓ *Eliminates Wear in Duct System*

Where the dust from a process has a recovery value, the Velocitrap provides a simple, practical and economical means of salvage.

The contaminated air removed by a dust control system is carried through the Velocitrap, where the bulk of the solids, including the heavier particles, are trapped in a dry state; ready to be returned to process.

Abrasive materials, which wear out the elbows of the ducting prematurely, are removed; resulting in longer life for ducting and collectors. Settling out of heavy materials in the duct lines is eliminated.



Send for Bulletin 246.

Schneible Velocitrap. Dry solids, air-borne at high velocity are ejected by centrifugal force from specially designed ports in the unit, becoming trapped in a hopper.

CLAUDE B. SCHNEIBLE CO.
2827 Twenty-fifth St. Detroit 16, Mich.
Engineering Representatives in Principal Cities

SCHNEIBLE

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on offset holes and blind holes. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-seven different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

ERRINGTON MECHANICAL LABORATORY

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NEW YORK
170 Broadway

CHICAGO
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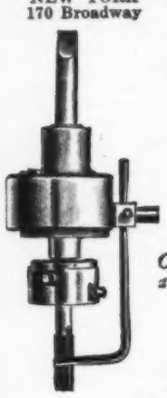
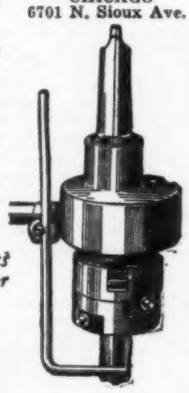
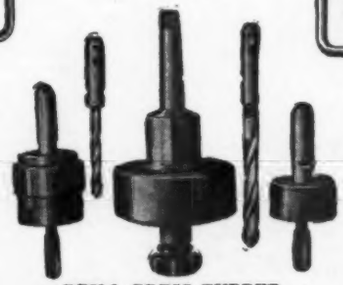


Size	Taps Exact Size
No. 00 H.S.	Up to ¼"
" 00	1/16" 1/8"
" 0	3/16" 1/2"
" 1	5/16" 3/4"
" 2	3/8" 1 "
" 3	5/8" 1¼"
" 4	7/8" 1½"
" 5	1¼" 2 "



Our High Speed Tappers are Super-Sensitive for Small Tapping



Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

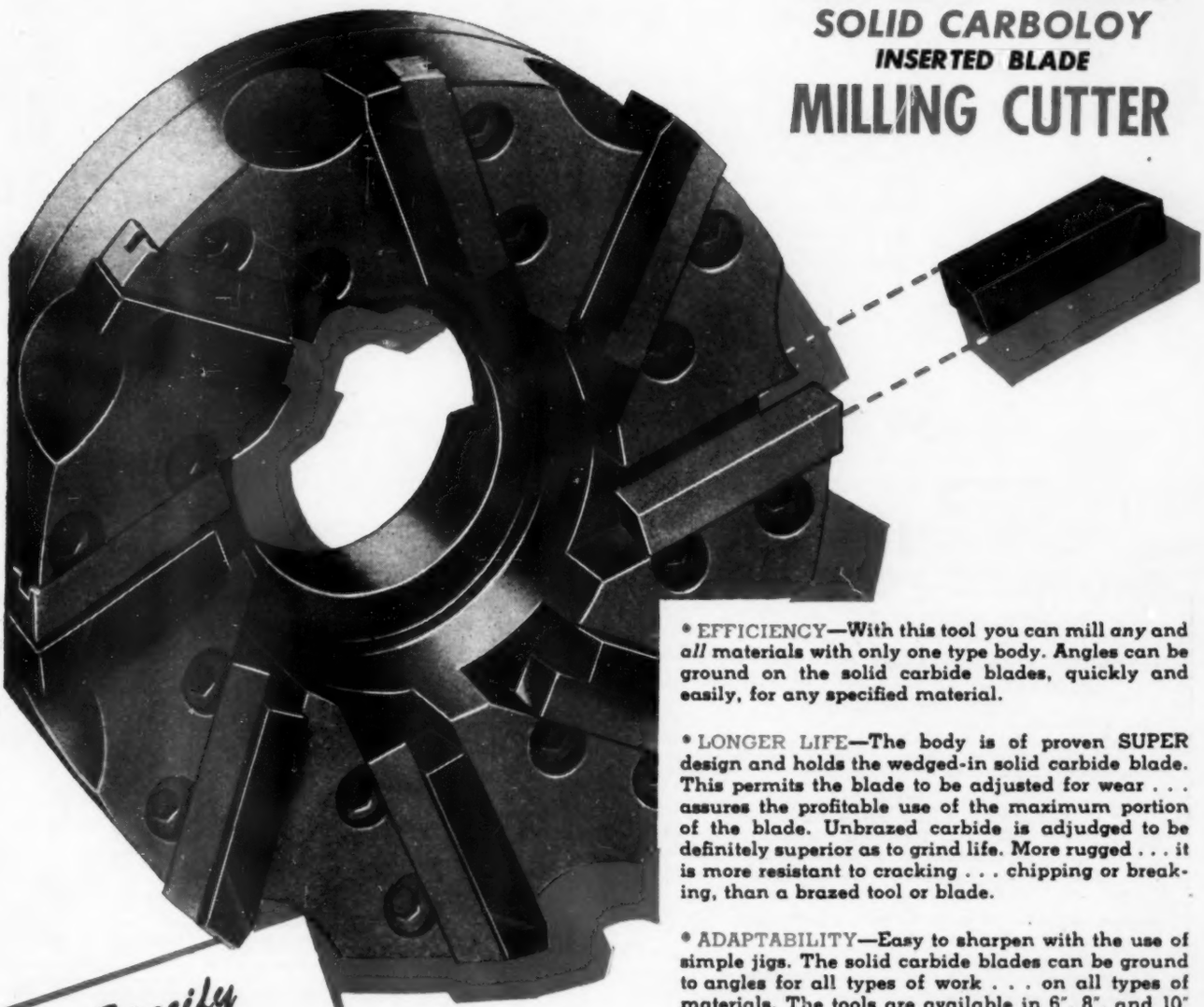
Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

1 NEW EFFICIENCY! 2 NEW LONG LIFE! 3 NEW ADAPTABILITY!

You get all three with the New SUPER

SOLID CARBOLOY INSERTED BLADE MILLING CUTTER



• EFFICIENCY—With this tool you can mill *any* and *all* materials with only one type body. Angles can be ground on the solid carbide blades, quickly and easily, for any specified material.

• LONGER LIFE—The body is of proven SUPER design and holds the wedged-in solid carbide blade. This permits the blade to be adjusted for wear . . . assures the profitable use of the maximum portion of the blade. Unbrazed carbide is adjudged to be definitely superior as to grind life. More rugged . . . it is more resistant to cracking . . . chipping or breaking, than a brazed tool or blade.

• ADAPTABILITY—Easy to sharpen with the use of simple jigs. The solid carbide blades can be ground to angles for all types of work . . . on all types of materials. The tools are available in 6", 8", and 10" diameters as standard tools. Special adaptations of their principles can be worked into special cutters of many sorts.

Specify SUPER CARBIDE-TIPPED TOOLS

★

For Turning, Facing, Reaming, Milling, Forming, Spot Facing, Boring, Grooving, Grinder Rests, Wear Parts, Counterboring, Shaving, Centers, and Special Purposes.

SUPER TOOL COMPANY

Carbide Tipped Tools

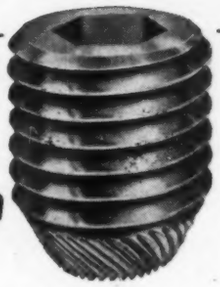
21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

UNBRAKO

Reg. U. S. Pat. Off.

SOCKET SCREWS

Have A Lot In Common



Pat'd & Pats. Pend.

1—GREAT STRENGTH

2—DEPENDABLE ACCURACY

3—*ALL THE ADVANTAGES OF KNURLING*

The "Unbrako" Socket Head Cap Screw (left) is a time- and money-saver, because its Knurled head provides a slip- and fumble-proof grip, even for oily fingers so it can be screwed-in faster and farther before it becomes necessary to use a wrench.

The "Unbrako" Socket Set Screw with the Knurled Point (above) is a ***Self-Locker*** because the knurled points dig-in and hold firm against even the most stubborn vibration. Yet, this screw can be easily backed-out with a wrench and used again and again.

In sizes from No. 4 to 1½"; full range of lengths. Send for the "Unbrako" Catalog. **"Unbrako" and "Hallowell" products are sold entirely through distributors.**

Knurling of Socket Screws originated with "Unbrako" in 1934.

OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA. BOX 4

Branches: Boston • Chicago • Detroit • Indianapolis • St. Louis • San Francisco

ENGINEERS-PRODUCTION-INSPECTION MEN!

BOOST PRODUCTION AND PRODUCT QUALITY — 15 DAY SHIPMENT ON URGENT ORDERS

Curtiss-Wright Corporation ranks our product with their best tools. Cleveland Graphite Bronze Company, Leading Bearing Manufacturer, States New High Accuracy Reached, Plus Substantial Production Boosts.

WITH

Young Roller Clutch Precision Mandrels

No More "C" Washers, Wrenches, Drawbars; No More Arcs or Tapers Before or After Expansion Grip—Concentricity in Low 10,000ths—Production or Inspection.

Assured parallelism of sleeve surface to center line—absolutely no variation in repeated mounting of parts.

Uniform full-work-length friction-locking gives complete control and contact of entire bore surface area—absolutely no variation in repeated mounting of parts—no tapers—Slip part on mandrel with slight counter-clockwise motion, that's all—it's ready—Self-contained, self-expansion, self-locking, self-contraction. Instant unloading, no jamming, no adjusting — Interchangeable sleeves—you do not obsolete Young Mandrels. Built to your bore tolerance high limit, with automatic contraction to low limit—Any mounting—Any machine operation—For bore diameters .718 to 5.5—Reduces tool costs, extra equipment investment, operating costs, maintenance, down time, scrap, salvage.

Patent Pending

Quotations Definitely Moderate

Good Delivery Schedules

YOUNG ARBOR CO. 3257 BRADFORD ROAD CLEVELAND HTS. 18, O.

STANDARD US SINCE 1915 HEADS

All Types of Fixed Center

DRILLING TAPPING & BORING HEADS

Four Spindle Head. All Spindles Adjustable for equally spaced holes.

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS

UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

Whoever thinks of hardness testing equipment thinks of the

"ROCKWELL" HARDNESS TESTER

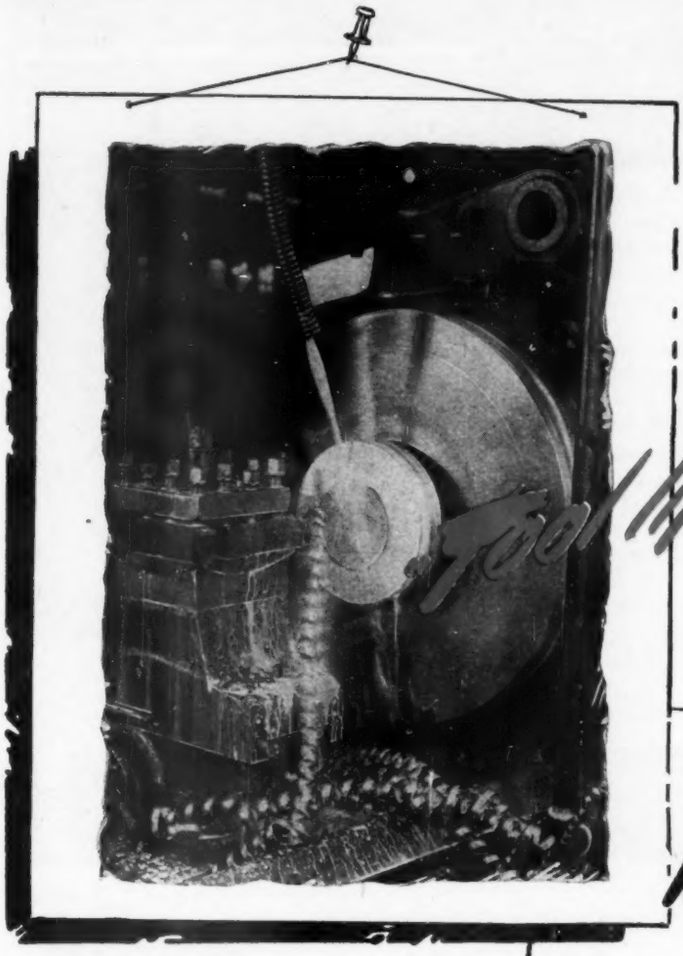
Now and always made only by

WILSON

MECHANICAL INSTRUMENT CO. INC.

357 Concord Ave., New York 54

An Associate Company of American Chain & Cable



"Tool life increased 35%

when we switched to Tycol #675"

Chips no longer weld to tools . . .
Tool regrindings reduced . . .
Gum deposits eliminated . . .
No more trouble with rust . . .

These are a few advantages of Tycol #675 Heavy Duty Cutting Oil observed at one large plant. You, too, will find that Tycol #675's demonstrated superiority will help you increase production . . . cut costs . . . produce finer, tarnish-free finishes.

For complete data about Tycol #675 Heavy Duty Cutting Oil, phone your nearest Tide Water Associated Office.

TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C.
Pittsburgh • Philadelphia

TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE • NEW YORK 4, N. Y.

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaiminated fluid.

A thorough, quick cleaning is definitely assured by flowing sequence. Two or more liquids may follow, making it possible to wash, rinse or provide any further treatment as required.

Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer

Barrett Centrifugal Washer—made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

Oil-Hole Subland Drills

Morse Taper Shank Subland Oil Hole Drill

Straight Shank Subland Oil Hole Drill

Looking for Quality Cutting Tools?

Looking for Better Service?

Then make Detroit Reamer and Tool Company your source for fine cutting tools.

You will discover THERE IS A DIFFERENCE.

Oil hole drills
*Oil hole subland drills
Oil hole subland reamers
Subland drills
Subland reamers
Circularity relieved reamers
Circularity relieved end mills
Combination drill and reamer
Special drills and reamers
Line reamers
Core drills
Special center drills
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Special countersinks
Flat and circular form tools
*Illustrated

Special Tools To Your Specification

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DETROIT REAMER & TOOL CO.

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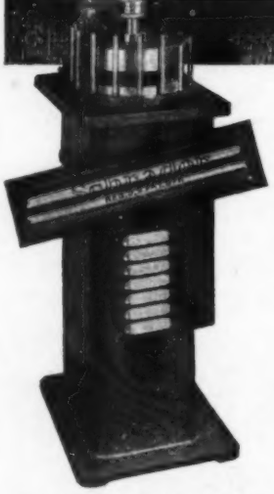
***Put Your* MARKING PROBLEMS *up to* NOBLEWEST**



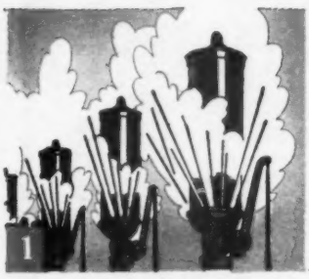
Let Noblewest's forty-one years of experience in designing and building the world's finest marking equipment help you solve your marking problems. Whatever your requirements — speed — precision — accuracy. Whatever the size or shape of your product, we will gladly make time and money-saving recommendations. Model No. 167, shown here, tooled for marking tire pressure gauges. Write Noble & Westbrook Manufacturing Co., East Hartford 8, Conn.

MARK IT BEST WITH

NOBLEWEST

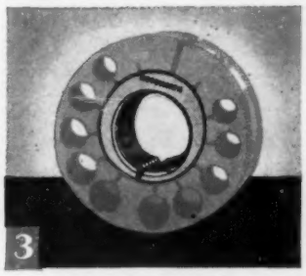
Hi-Speed Marking Machines

Holy Smokes! They've done it again!

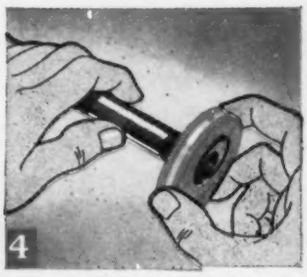


Blow all the whistles! They've done it again!

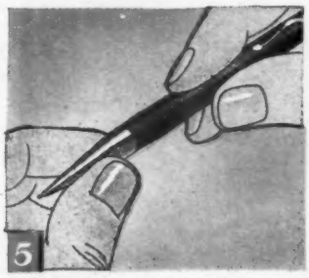
Blast out a fanfare for a great new Woodworth invention!



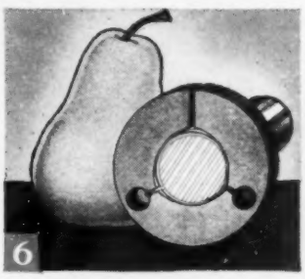
It's the Woodworth Adjustable Thread Ring Gage.



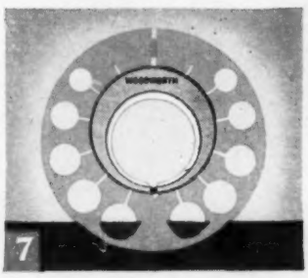
Thread ring gages check the O.D. of threaded parts.



Adjusting 'em as they wear down saves time and money.

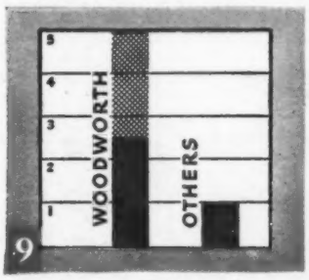


But old types get pear-shaped —lose accuracy—wear out fast.

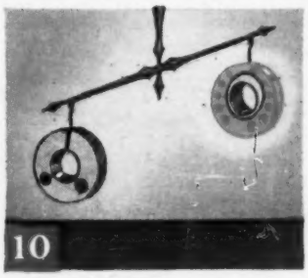


This Thread Ring Gage adjusts perfectly — *stays round.*

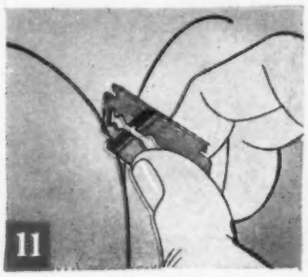
Never gets out of line when dropped or thrown about.



Equal distribution of wear increases life 2½ to 5 times.



Light weight reduces operator fatigue — increases sensitivity.



It's amazingly accurate . . . ideal for hair-splitting work.

Woodworth's New Thread Ring Gage is an all-time champion!

Another Woodworth contribution to production

THE NEW Adjustable Thread Ring Gage, another revolutionary Woodworth instrument of accuracy, is now available to industry!

Employing an entirely new principle of design, and proven mathematicaliy correct by actual tests, this gage assures roundness through the maximum range of adjustment.

Check these
Five Important Advantages

1. *Greater Accuracy and Stability.* Stays round with adjustment. Threads held in alignment of thread helix angle with adjustment. Will not reject parts that should pass inspection.

2. *Longer Wear Life.* Equal distribution of wear over the full thread circumference, throughout the entire range of adjustment, increases wear life 2½ to 5 times.

3. *Less Weight.* Aluminum alloy outer body halves the weight to greatly reduce operator fatigue and increase sensitivity.

4. *Positive Identification.* Green outer body for GO GAGE and red for NOT GO GAGE saves time for operator.

5. *Positive Adjustment.* Cannot be thrown out of adjustment by ordinary blows or falls that change setting of conventional gages.

You can speed up production and decrease gaging costs on your thread inspection operations with this amazing instrument! Write for completely illustrated folder 46-R.

ACCURACY YOU W CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD
DETROIT 20, MICHIGAN

PRECISION GAGES

PRECISION MACHINED PARTS

DIAPHRAGM CHUCKS—SPECIAL TOOLS

ADJUSTABLE CLAMPING JIGS

NOW AVAILABLE FOR IMMEDIATE DELIVERY

THE *New* CLEVELAND INDEX HEAD

Regrind YOUR TOOLS IN EXACT CONCENTRICITY ON ANY SURFACE GRINDER

DESIGNED TO HOLD ALL TOOLS WITH STRAIGHT OR TAPER SHANKS From 1/16" to and incl. 1-1/2" Diam.

No longer need you discard your taps, reamers, end mills, etc., when they become worn or damaged.

360 degree graduations in three planes enable you to grind any desired angle or cutting edge on your tools with factory precision . . . in your own shop . . . on any surface grinder.

Write for catalog and complete information. See for yourself how you can reduce your tool maintenance costs with the Cleveland Index Head.

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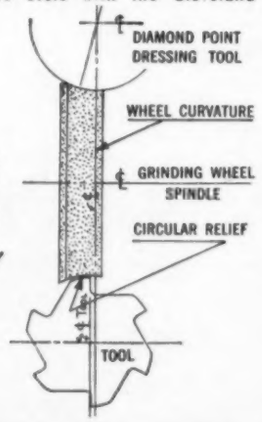

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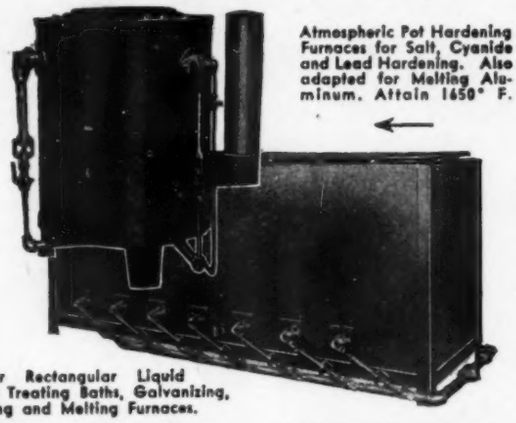

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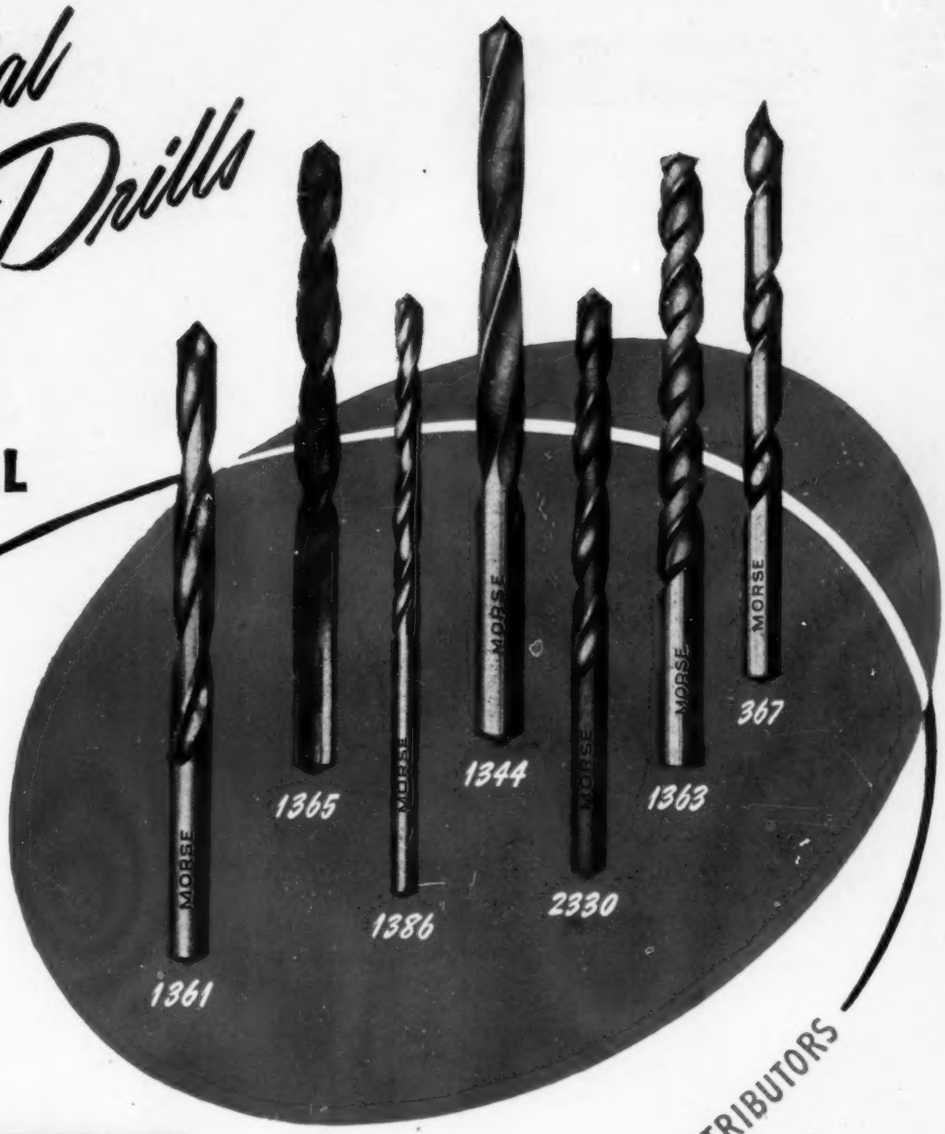

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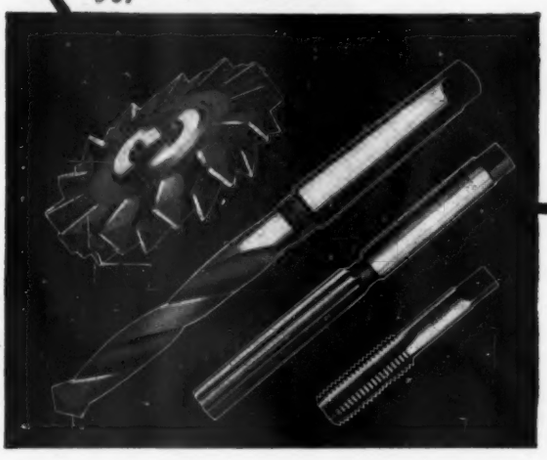

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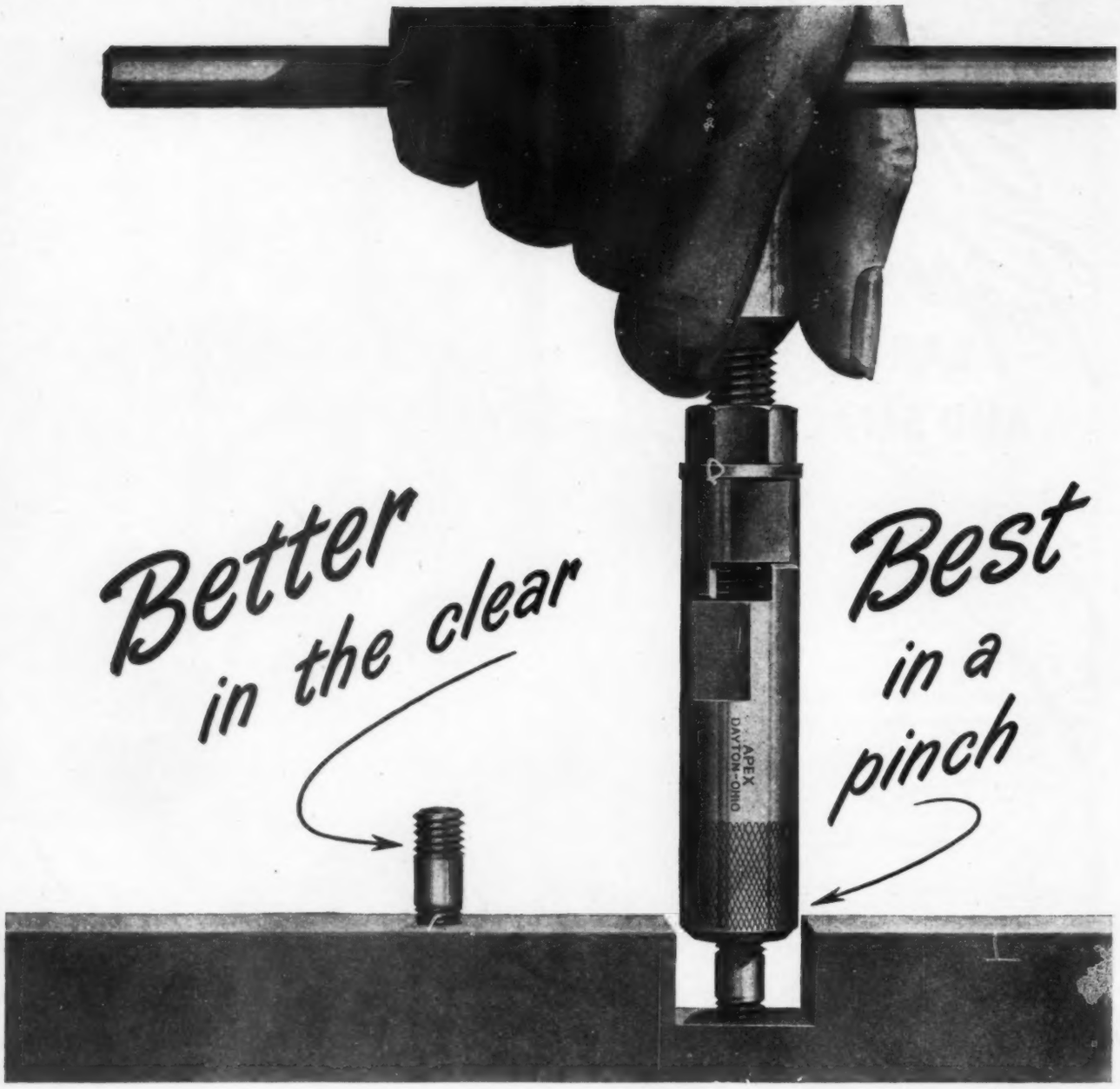

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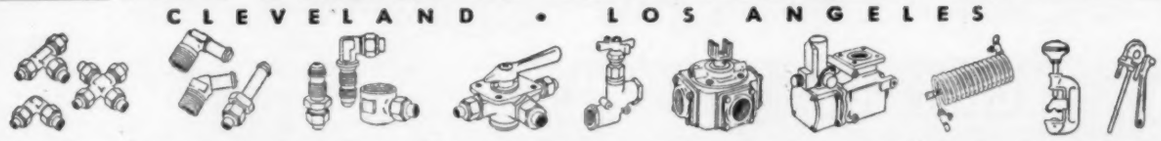

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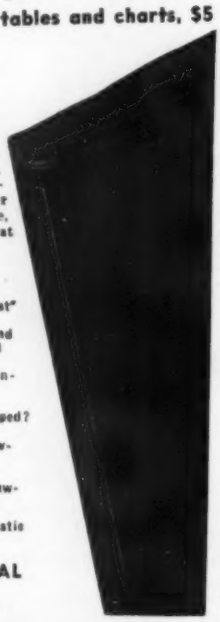

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21/32"	15	12	8.00	31/32"	15	12	14.00
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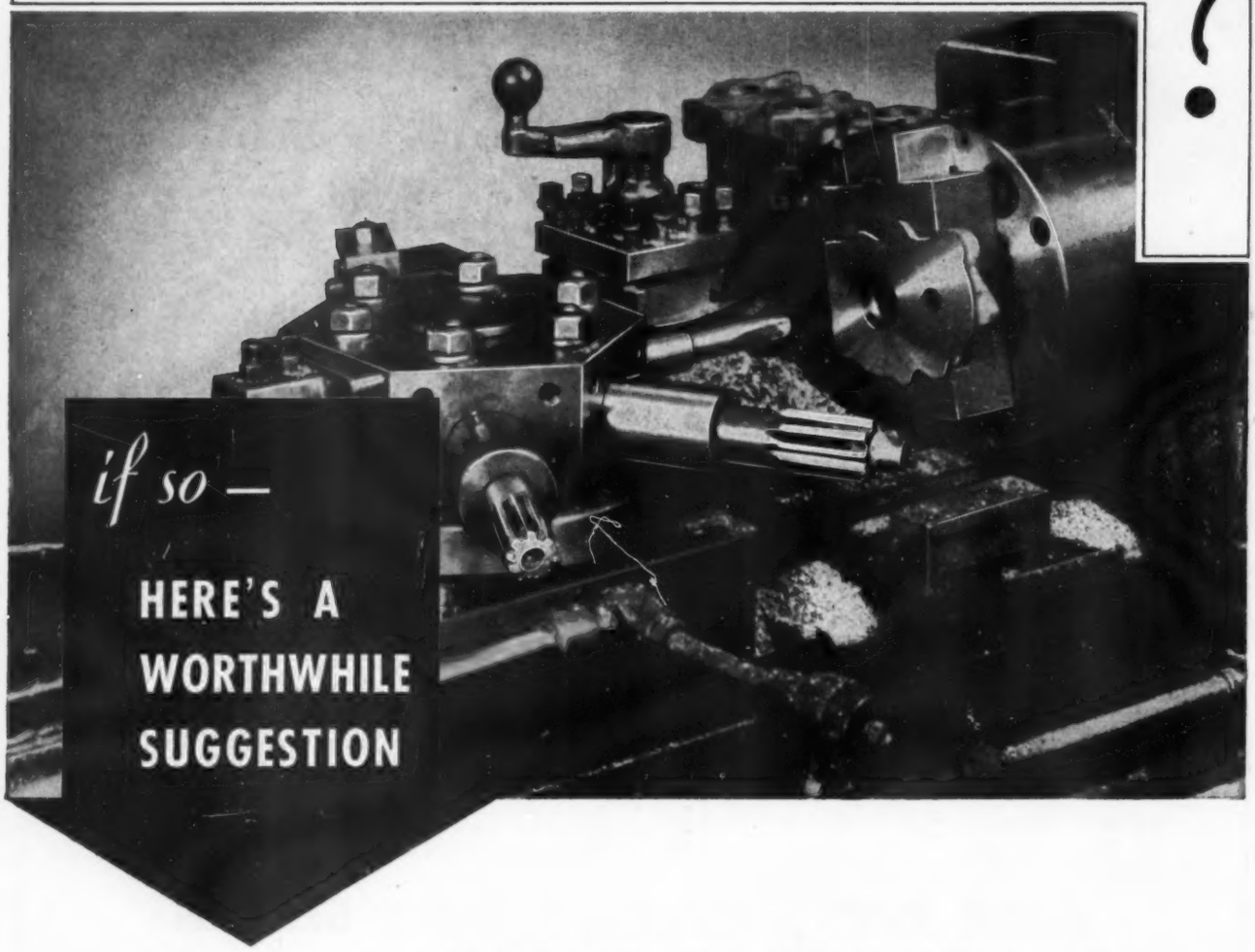

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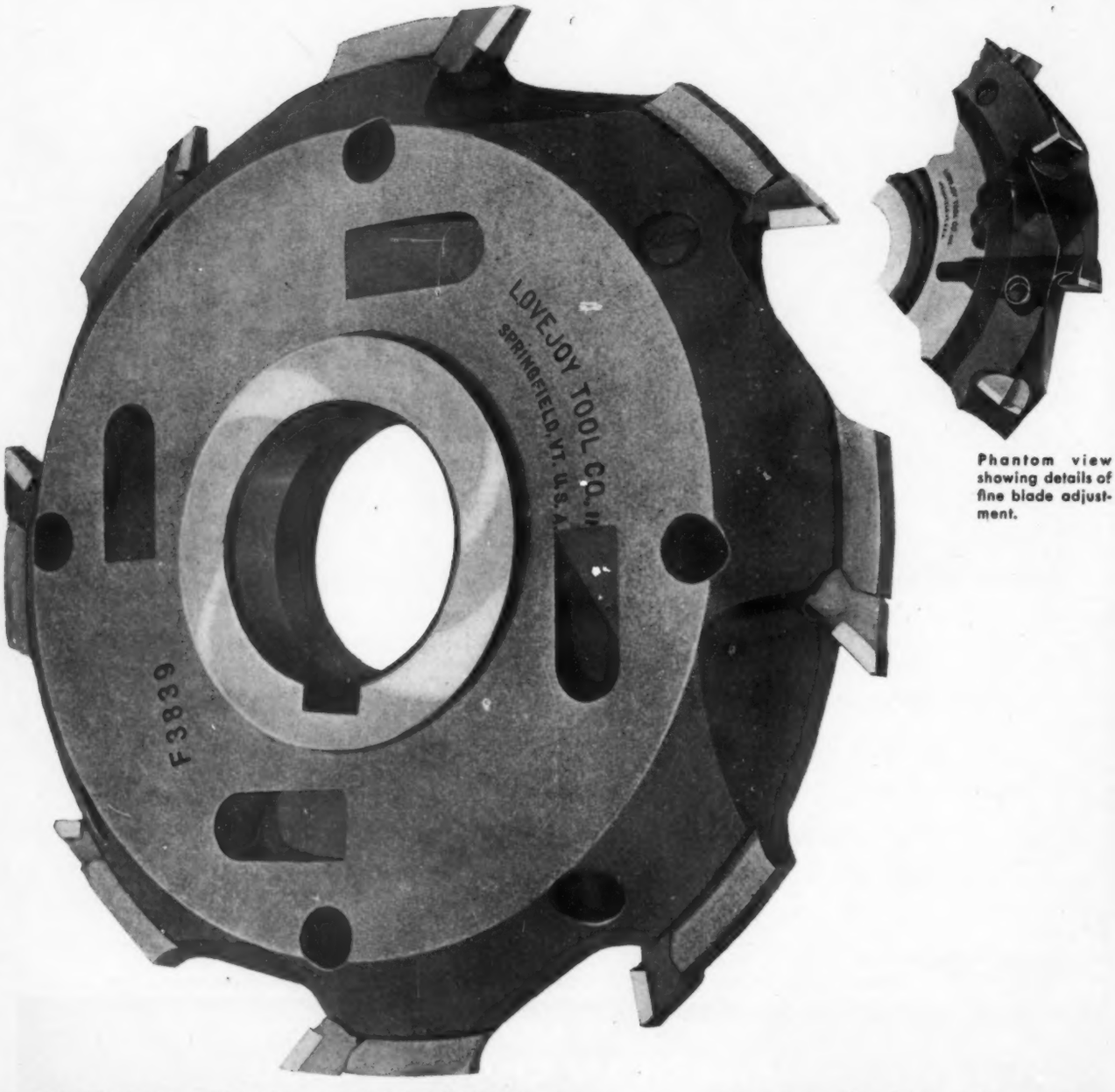

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POSITIONS VACANT

MACHINE TOOL Manufacturer, located in Midwest, has available capacity at the present time in Planer, Lathe, and Milling Machine Departments. Please address inquiries to P-642, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EXPERIENCED FIXTURE designer wanted. Good opportunity for high grade man. Give full particulars as to experience and salary desired. Application will be treated as strictly confidential. Consolidated Machine Tool Company, Rochester 10, N. Y.

SELLING OPPORTUNITY OFFERED

MANUFACTURERS REPRESENTATIVES wanted by a large established company, manufacturing industrial reamers. Territories available in a number of sectors. Representatives who are now selling allied but non-competitive lines preferred. RW-645, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-six years' recognized standing and reputation carries on preliminary negotiations for supervisory technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

INDUSTRIAL MECHANICAL Engineer—qualified and experienced in the fields of production control, manufacturing and engineering liaison. Excellent record in developing efficient organizations. Have the capacity to get things done. Six years at present position in the precision manufacturing business. PW-620, American Machinist, 330 West 42nd St., New York 18, N.Y.

MECHANICAL ENGINEER: Desires position as Chief Engineer in small or medium size company. 20 years experience in design, machine shop, production, plant management, cooperative, resourceful, inventive, good character, successful record. PW-646, American Machinist, 330, W. 42nd St., New York 18, N. Y.

EX-NAVAL OFFICER, 28, arts college graduate with subsequent experience in machine tool operation, production engineering, and plant layout desires position assisting production engineer of medium sized manufacturing concern within 100 miles of N.Y.C. Opportunity to learn and advance is prime consideration. PW-647, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATTERNMAKER: CAPABLE taking over shop estimate cost and layout work to produce accurate sound castings. General pattern shop experience both wood and metal patterns. Know how to handle men and train apprentice. First class mechanic can qualify as working foreman in small shop or supervise large shop. PW-648, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SUPERINTENDENT-FACTORY manager. Industrial executive background of 33 years in the machine and tool manufacturing. Practical and executive experience in the making of precision tools, dies, jigs, fixtures, gages, and special machinery. Trained in the handling of large personnel. PW-649, American Machinist, 330 W. 42nd St., New York 18, N. Y.

Management Engineering Executive
Mechanical Industrial Engineer. 30 years of demonstrated ability balancing technical knowledge with common sense. Excellent record of increasing production, reducing costs, developing an efficient organization and handling difficult labor relations. Capacity to direct and accomplish results in a harmonious manner.
PW-638, AMERICAN MACHINIST
330 West 42nd Street New York 18, N. Y.

WANTED

Experience design engineer for immediate and permanent employment. By a progressive manufacturer of precision machine tools for rebuilding internal combustion motors, primarily automotive. A pioneer in the field with world wide distribution for over 25 years and located in medium sized mid-west city. If you would like to affiliate with a well-established company that is small enough so that individual merit is bound to receive just recognition, write giving complete personnel history enclosing recent photograph. All replies confidential.

P-556, AMERICAN MACHINIST
330 WEST 42nd St., NEW YORK 18, N. Y.

Machine Engraver—First Class
EXPERIENCED WITH DIES SUCH AS USED ON RADIOS, DASHBOARDS, ETC; ABLE TO
1. Take charge of new dept.
2. Or work under supervision
Old established plant; N. Y. area. Permanent position. Write full experience, salary expected.

ETCHED PRODUCTS CORP.
39-01 QUEENS BLVD., L. I. CITY, N. Y.

WANTED

Foreman for small Machine Shop located in Northwestern Pennsylvania. Must have Machine Tool experience. Write giving age, experience, starting salary expected and when available.

P-527, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

POSITIONS WANTED

MACHINIST: age 33, highly experienced all around, 15 years tool room and precision manufacturing. Motion picture projectors, time recording devices and cannon (ordnance) experience. 3½ years as jr. foreman and setup man in milling machine and automatic duplicating on Pratt & Whitney Kellers and Hydrotels. Seeking employment with a progressive co. PW-650, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MASTER MECHANIC or shop superintendent. 20 years experience all types shop work and field erection and repairs, Jr. member A.S.M.E. 34 years of age, married, no children. Would like foreign or domestic position. PW-658, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PLANT OR Factory Manager: With ability, experience, tact and initiative. Engineering and administrative training. Wide and practical experience and demonstrated ability in small and large volume manufacturing. Capacity to direct and get things done profitably. Can build up an organization and get the most out of it. PW-659, American Machinist, 330 W. 42nd Street, New York 18, N. Y.

FACTORY MANAGER, or chief industrial engineer. Graduate, cooperative mechanical engineering course. Age 44. 28 years experience includes operating supervision, material and production control, purchasing, time study and standard control of labor costs, methods, work simplification and cost reduction programs, maintenance cost, cost control, and tool usage control. Manufacturing background includes locomotive repair, cast iron pipe, printing and lithographing, harness and clothing hardware, slide fasteners, electronic and powered metal parts. Production tooling, equipment, and techniques for strip steel and brass, wire, and small cast parts production, assembly and finish. Successful labor relation administration. PW-660, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

(Continued on opposite page)

MODERN PRECISION MACHINE TOOLS

ALL LATE MODEL
INTEGRAL
MOTOR DRIVEN

PUNCH PRESSES
LATHES
MILLING MACHINES
GRINDERS
TURRET LATHES
DRILL PRESSES
HEAT TREATING
EQUIPMENT and
PRECISION INSTRUMENTS

METAL STAMPING
and DIE SHOP EQUIPMENT

COMPLETE AUTOMOTIVE PARTS
MANUFACTURING DEPARTMENT
and the
INDUSTRIAL REAL ESTATE

of the A. B. EQUIPMENT MFG. CO.
2131 W. Fulton Street, Chicago

TO BE SOLD AT PUBLIC ★ AUCTION!

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FIRST NATIONAL BANK BLDG. • CHICAGO 3, ILL.
★ WE MAKE CAPITAL OF IDLE ASSETS

POSITIONS WANTED
(Continued from opposite page)

PRODUCTION CONTROL Manager: 10 years experience production planning and control, scheduling, machine loading, receiving, stores, shopping, material handling, inventory control. Diversified experience in job order and mass-production methods, metal fabricating, machining and mass assembly both small and heavy equipment. Outstanding record of increased production through practical application and coordination. Highest references, salary commensurate with position offered, age 36, married, dependents, any location. PW-661, American Machinist, 330 W. 42nd St., New York 18, N.Y.

SELLING OPPORTUNITIES WANTED

MANUFACTURERS AGENTS, engineering background, now selling outstanding machine component to diversified industrial fields. Will consider additional lines for California. Large following of progressive engineers constantly contacted. Proper representation guaranteed. Give full details. RA-633, American Machinist, 68 Post Street, San Francisco 4, Cal.

MANUFACTURERS: MACHINE tools and industrial equipment: Products must increase operation efficiency and reduce manufacturing costs. Manufacturers representative with finest contacts with machine shops and manufacturers of metal products in northern Illinois excluding Chicago seeking three additional quality product lines. Background—Graduate Apprentice Machinist, Purchasing, Sales, Industry Advisory capacity war-time government agency. RA-651, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MANUFACTURERS REPRESENTATIVE, twenty years machine tool sales experience, desires additional lines of machine tools and cutting tools for Western Michigan. RA-657, American Machinist, 520 N. Michigan Avenue, Chicago 11, Ill.

MANUFACTURERS: ACCOUNTS solicited by sales engineers representing manufacturers in Indiana, Ohio, Michigan. Designing staff available. Include literature with proposal. Barton and Burns, P. O. Box 373, Fort Wayne, Ind.

PATENT ATTORNEY

PATENTS, COPYRIGHT, Booklet "General Information concerning inventions and patents" and "Fee Schedule" sent without obligation. Established 1915, Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

MANUFACTURERS REPRESENTATIVE
PHILADELPHIA & VICINITY

Active in this area for past 25 years possessing sales and executive ability invites correspondence with manufacturers of products salable to Machinery and Machine Tool Users. Organization should be high grade and progressive in product and management.

RA-637 American Machinist
330 West 42nd St. New York, N. Y.

MANUFACTURERS REPRESENTATIVE
CLEVELAND AND VICINITY

Resident of this area for past 15 years, with 25 years Tool Engineering experience, invites correspondence with manufacturers of tools and machines salable to the machine tool industry IN NORTHERN OHIO.

RA-654, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

WANTED
STRUCTURAL & MECHANICAL
WORK
TO DESIGN & DETAIL
HAGERSTOWN ENGINEERING CO.
901 VIEW ST. HAGERSTOWN, MD.

INVENTOR

Offers two patents in partnership deal in precision tool factory.

Or wanted tool engineer perfect in micrometer fabrication for new kind of instrument, with capital for partner.

BO-635, AMERICAN MACHINIST
330 W. 42nd St. New York 18, N. Y.

WANTED
MANUFACTURER
with **DIES**

For copper holloware and flatware for gift trade.

GIFT CRAFT CO.
505 5th AVE., NEW YORK 17, N. Y.

WANTED

SALES ENGINEERS

To represent a modern gear manufacturing plant. Must have a degree in mechanical engineering as well as extensive selling experience in the gear industry. Write full details including name of university and year graduated; names and addresses of former employers; salary and territory desired and other pertinent details.

SW-609, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED—*New Products*

Railway rolling stock accessories and equipment . . . Round House Equipment . . . Similar or related products selling to industrial markets.

Our client, an established manufacturer, will buy a successful product or a company making one.

PLEASE WRITE. Communications held confidential.

CHARLES H. WELLING & CO., INC.
52 Vanderbilt Ave., New York 17, N. Y.
INDUSTRIAL CONSULTANTS
New Products — New Processes

Equipment Wanted Advertising—page 275

of the WORLD'S LARGEST AUCTION SALE

Absolute • Final • Unrestricted

METAL WORKING MACHINERY

(original cost over $12,000,000)

More **Machine Tools — *Widest* Variety**

Finest **Makes — *Closest* Tolerances**

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Makers of the Famous Cyclone Aircraft Engines

This is a BUYER'S Sale! Here's Why!

No **Preferences — *No* Priorities — *No* Red Tape**

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ALL BUYERS ARE ON AN EQUAL FOOTING

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Complete Catalog **— $1.00 each. Catalog contains detailed listing, individual and group photos, numerical order of sale, maps, with locations of plants and departments, complete terms of sale, etc.**

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EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

3—#00 Brown & Sharpe Standard Speed
6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle.
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 1⅝" 4-spindle Automatics, complete
2—#55 National Acme 1⅝" 4-spindle Automatics, complete
1—#2G Brown & Sharpe Automatic.
1—#1 Brown & Sharpe Automatic, old style.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.
72" Cincinnati Heavy Pattern Vertical Boring and Turning Mill.
60" Colburn Heavy Pattern Vertical Boring & Turning Mill, 2 heads, motor drive.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
Natco #14, 22 spindle Rectangular head Drilling Machine.

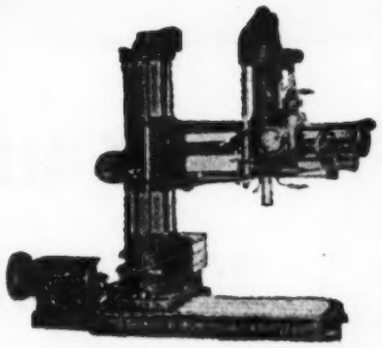
RADIAL DRILLS

3' 9" column Cincinnati-Bickford.
3' 9" col. American, S.P.D.
3' Dreses, 10" col. QCG., M.D.
3' 10" Col. Fosdick.
5' Arm 13" Column Cincinnati-Bickford.
5' Arm, 14" Column Fosdick, motor drive.

GRINDERS

1—#3 LeBlond Tool and Cutter, Motor Drive
1—#11 Brown & Sharpe Cylindrical Single Pulley Drive

Blanchard Grinder #16, 30" dia. magnetic Chuck, 25 HP 3-60-440 V. Motor.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14" x 36" with 10" x 36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

#33 Abrasive Vertical Surface.
#3 Abrasive Horizontal Surface.
12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
10" x 18" Norton Cylindrical.

LATHES

14" x 6' Hendey Toolroom, geared head.
14" x 8' LeBlond Toolroom, cone drive.
14" x 12' Hendey Toolmakers, motor drive.
16" x 6' Rockford Toolroom Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' American Motor Driven, taper.
27" x 18' Lodge & Shipley Geared Head.
26" x 12' Putnam Quick Change Gear.
18" x 6', 20" x 8' American 12-speed geared head, M.D.

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive.
2—#4 Warner & Swasey Universal Hand Screw Machines, arr. Motor Drive.
16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal
#6A Potter & Johnson Automatic Chuckers.
#3R Gisholt Universal like new.
#4 Warner & Swasey with Cross Sliding Turret, Motor Drive.
#4 Foster Turret Lathe.

PLANERS

30" x 30" x 10' Cinn. Heavy Pattern, 2 Hds.
20" x 20" x 24" N.-B.-P., Planer Shaper, M.D.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#2½, #3 LeBlond Universal.
3B Hendey Universal Miller, single pulley drive.

POWER PRESS HEADQUARTERS

#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed 24" x 36", 4-post.
3—25 ton K. R. Wilson Hydraulic Presses.
75 ton H.P.M. 2 post, Hydraulic Press.
#1 Bliss Straight Side, double action, Cam Press. Plain flywheel drive, double roll feed.
#22C Ferracute Plain, motor drive.

SHAPERS AND GEAR CUTTERS

20" Gould and Eberhardt Single Pulley Drive
#1 Adams Gear Hobbers, Belt driven (3).
16" Gould and Eberhardt.
21" Smith & Mills B.G. Helical Gears.
24" Gould & Eberhardt Shaper.

SHEARS & METAL WORKING

#2 Hilles & Jones Bending Rolling, 8' x 7/16 drop end.
Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Gould & Eberhardt Slitting Shear, 10 ga.
Bertsch 3"x36" Gegred Slip Roll Former.
Niagara 48" Roller Leveller, 6 Rolls.
12" x 12 Gage Loy and Nawrath Geared Underdriven Power Squaring Shear.

MISCELLANEOUS

Waterbury-Farrell Cold Header, double stroke, open die, ½" x 6".
Manville Cold Header, single stroke, solid die, 3/16" cap.
Manville #3 Thread Roller, ⅜ capacity

Thomson Cutter and Creaser, 12½ x 18½.
Heat Treating Furnaces for the tool room.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12 x 2 x 12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½. New this year.
#5A High Speed Riveting Hammer.

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MACHINERY COMPANY
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SPECIALS:

MORTON boring, drilling, milling and draw cutting traveling head planer 60" stroke

INGERSOLL 42x36x16' Planer Type Miller

NILES-BEMENT-POND, Boring Mill—7" Bar—horiz.

MATTISON 16x24x96" High powered surface grinder

GOULD & EBERHARDT #96H Gear Hobber with Differential

NEARLY ALL BUILT AFTER 1941

GRINDERS

HEALD #70 Internal
HEALD #81 Plain Internal Grinder, latest type
BRYANT #5 Int. Grinder, Chucking, latest
BROWN & SHARPE #5 Pl. Cyl. 3x18; latest
CINCINNATI #2 Plain Cutter Grinder, latest
NORTON 10"x96" Pl. Cyl. Grinder, latest
LANDIS 4x12 Type H Pl. Cyl. Hydraulic; latest type
LANDIS 10x48 Type C Pl. Cyl. Hydraulic; latest type
NORTON 24x240" Pl. Cyl.; motor drive
NORTON 6x18 Surface; latest type
GALLMEYER & LIVINGSTON #25 6"x18" Surface; Hydraulic, latest type
GALLMEYER & LIVINGSTON #35 8"x24" Surface; Hydraulic, latest type
MATTISON 16x24x96 Surface; latest type
MATTISON 14x16x46" surface; latest type
BLANCHARD #16 motor drive; 26" chuck
PRATT & WHITNEY 14x60 Sur. Hydraulic; latest type
ARTER 8" Rotary Surface
ARTER Automatic Piston Ring
BROWN & SHARPE, #1, #2, #3 Univ.; latest
LEBLOND #2 Univ. Tool & Cutter; latest
BROWN & SHARPE #13 Univ. & Tool; latest
BROWN & SHARPE #4 Univ; latest type
NORTON 23x72" Pl. Cyl. Type C latest type
PRATT & WHITNEY Contour Cutter Grinder; latest type
UNIVERSAL Spline Shaft; Hydraulic
OLIVER #510 Twist Drill Grinder—latest type
LEBLOND #2 Univ. & Tool; latest type

BORING MILLS—Horizontal

DEFIANCE #26—Timken—latest type
GIDDINGS & LEWIS #25T 2½" Bore—latest
LUCAS #32, 3¾"' Bar; Latest Type
LUCAS #42, 4" bar; latest type
GIDDINGS & LEWIS #0, 3⅛" bar
NILES BEMENT POND, 5' Bar
NILES BEMENT POND, 7" Bar
NILES BEMENT POND—4½" Duplex

BORING MILLS—Vertical

BULLARD 24", 36", 42" New Era Type
BULLARD 54" Spiral Drive; latest type
BULLARD 86" 2 swivel heads, motor drive
KING 72", 2 swivel heads; motor drive
NILES BEMENT POND 84", 2 Sw. hd., M.D.
NILES BEMENT POND 120", 2 Swivel heads; Motor Drive
NILES BEMENT POND 90" 2 swivel heads, motor drive
BETTS 120" 2 swivel heads, motor drive

DRILLS

AVEY #1, 3 spindles
AVEY #2, 1 to 6 spindles
LELAND & GIFFORD #1, 1 & 2 spindles
NATCO #12 multiple spindle
NATCO C-13H multiple spindle
PRATT & WHITNEY #1/2B x 30"; #1/2B x 50", 2 spindle Deep Hole
CINCINNATI BICKFORD 3'9" Radial; latest type
AMERICAN 5'11" Radial; latest type
WESTERN 4', 5'6' Radial, latest type
FOSDICK 5'15" Column Radial, latest type

GEAR CUTTING EQUIPMENT

FELLOWS #7, #7A Gear Shaper
GLEASON 3", 6", 11", 18" Bevel Gear Generators
GLEASON 12" Bevel Gear Generator; latest
GLEASON 10", 15" Spiral Bevel Finisher
GLEASON Bevel Gear Tester
BROWN & SHARPE #13 Gear Cutter
BROWN & SHARPE #6 x 40 Gear Cutter
BARBER COLMAN #3 Gear Hobber
GOULD & EBERHARDT 48H Gear Hobber; latest type
GOULD & EBERHARDT #96H Gear Hobber with Differential
CINCINNATI Gear Burnisher
GLEASON 24" Bevel Gear Planer

PLANERS

CINCINNATI 24" Crank
LYND FARQUHAR 26" Open side
CINCINNATI 36x30x5' Box Table, PRT, 2 heads
CINCINNATI 36x36x12' Box Table, PRT, 4 heads
HAMILTON 42x42x20', 4 heads
GRAY 48x48x16', 4 heads
CLEVELAND 48x48x16' Open Side, 3 hds.
DIETRICH & HARVEY 48x48x16', 4 hds. Hydraulic
NILES BEMENT POND 96x80x20', Box Table, 4 hds, Hydraulic, PRT
CINCINNATI 120x96x20', 4 hds, box table, PRT

MILLING MACHINES

BROWN & SHARPE #2A Univ., Timken Bearing, latest type
VAN NORMAN #26, #36 Univ., Timken Bearing, latest type
KEARNEY & TRECKER #2H, #2K Plain, Timken Bearing
GORTON #8, #8½D Vert. high speed latest
KEARNEY & TRECKER #2H (MILWAUKEE) Vert. timken bearing, latest type
KEARNEY & TRECKER #4H (MILWAUKEE) Vert. timken bearing, latest type
KEARNEY & TRECKER #3K, #4K Ver., Timken Bearing

YOUR INQUIRIES ARE INVITED . . .

MOREY MACHINERY

USED MACHINE TOOLS

BROWN & SHARPE #10, #12 Auto., Timken
KEARNEY & TRECKER #1218 Auto., Timken
CINCINNATI 45x48 Hydromatic, Timken
INGERSOLL 36x48x18" Planer Type, 4 heads
INGERSOLL 42x36x16' Planer type, 4 heads
MOREY #12M 2-spindle Milling & Profiler
CINCINNATI #3DT, #4H, Ver., Timken
CINCINNATI #0-8 Vert. Timken Bearing, Latest Type
KENT OWENS #2 RV Hand Miller, Timken Bearing, latest type
BROWN & SHARPE #2B Pl., standard type, Timken Bearing
CINCINNATI #0-8 plain auto miller, Timken bearing, latest type
CINCINNATI #1-12 plain auto miller, Timken bearing, latest type
CINCINNATI #1-18 plain auto miller, Timken bearing, latest type
CINCINNATI #4-36 Hydramatic Timken bearing—latest type
CINCINNATI #56-108 Hydramatic Timken bearing—latest type
CINCINNATI #2 plain miller, Timken bearing—dial type
CINCINNATI #4 plain miller, Timken bearing—dial type
CINCINNATI #5 plain miller, Timken bearing—dial type
KEMPSMITH #2 Plain, Timken Bearing, latest type

JIG BORERS

CINCINNATI BICKFORD 28", latest type
LINLEY High speed, latest type

THREAD MILLING MACHINES

PRATT & WHITNEY 4½x12, 6x20 Model C, latest type
LEES BRADNER Model LT 6x36, latest type
PRATT & WHITNEY 6x120, 6x132, M.D.
MOREY SHIELDS 12x30, 12-60, 12x120, 12x192, latest type

SHAPERS

JONES 6" Vertical, latest type
PRATT & WHITNEY 6" Vertical
MOREY 10" Vertical, latest type
PRATT & WHITNEY 10" Vertical
MOREY 14" Vertical, latest type
MORTON 30" Draw Cut
DILL 18" Vertical Slotter

LATHES

MONARCH 14x30 centers Timken Bearing, latest type
AMERICAN 16x8' bed
LODGE & SHIPLEY 18x8' bed, geared head
LEBLOND 16"x102" Centers; Timken Bearing, latest type
LEBLOND 18x54 centers, Timken bearing, latest type
LEBLOND 21x16' bed, geared head
LEBLOND 20"x140"; latest type
MONARCH 30"x10' bed, Timken Bearing
HENDEY 12x54 centers Mfg. Type
HENDEY 14x42 centers; latest
HENDEY #3x54 centers Mfg. Type
LEBLOND 16"x5' Centers; Timken Bearing, latest type rapid production
LEBLOND 20"x10" Centers—timken bearing, latest type rapid production
LEBLOND 17x6', 9' and 14' bed Timken, Mfg. Type
AXELSON 20"x139" Centers; latest type
SENECA FALLS 8"x60" Lo Swing Timken Bearing, latest type
LODGE & SHIPLEY 30"x18' Bed
NILES 38"x18' Bed "Time-Saver"

LATHES—TURRET

MOREY #2G, 1" cap. Timken Bearing
MOREY #3 Univ., 1½" cap. Timken Bearing
MOREY #4 Univ., 2" cap. Timken Bearing
WARNER & SWASEY #1A Univ. Timken Bearing
WARNER & SWASEY #2A Univ. Timken Bearing
WARNER & SWASEY #3 Univ. 1½" cap. Timken Bearing
BARDONS & OLIVER #3, latest type
GISHOLT #2L Univ. Timken Bearing
POTTER & JOHNSON #6C; motor drive
JONES & LAMSON #3 Univ. Timken Bearing—latest type
JONES & LAMSON #5 Univ. Timken Bearing—latest type
JONES & LAMSON #7C Univ. Timken Bearing—latest type
WARNER & SWASEY #3A Univ.
GISHOLT #3 Univ. Timken Bearing—latest
GISHOLT #4 Univ. Timken Bearing—latest
LIBBY 1Y-5 Timken Bearing—latest type

AUTOMATIC SCREW MACHINES

CLEVELAND ⅞" to 2½" Model A
CONO-MATIC 3½", 4 spindle, latest type
NEW BRITAIN #65—latest type

PRESSES

CLEARING #SO-842 single action, 215 tons, latest type
CLEARING Type K-1200-30 Knuckle Joint, 200 tons, latest type
CLEARING Type F-1100-36 single action, 100 tons, latest type

MISCELLANEOUS

CLEVELAND 12x16" Cutter Relieving Machine
WATSON STILLMAN Hyd. Straightening Press
BLOUNT 4"x6' Speed Lathe
SAUNDERS #9, 8 to 18" Pipe Machine

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No. 61 New Britain, 1⅝" capacity.
16" x 33" Fay Automatic Lathe.
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4 ft. Carlton Radial, enclosed head.
No. D2 Colburn, single spindle.
42" Barnes, sliding head.
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
★ No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse Taper, rectangular head 20" x 40".

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No. 61 Fellows Gear Shaper, m.d.
No. 5AC Lees Bradner Gear Hobber.
6" Gleason Straight Bevel Gear Generator.
No. 5—48" Cincinnati Automatic Gear Cutter.

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No. 3 Abrasive Surface Grinder.
No. 22 Heald Rotary Surface Grinder.
No. 16—26" and No. 16—30" Blanchard Surface Grinder.
76" Rogers Knife Grinder, Type B.
No. 72A3 Heald Gagematic Internal Grinder.
No. 70 and 75 Heald Internal Grinders.
No. 13 Brown & Sharpe Universal & Tool Grinder.
14" x 48" Landis Universal, hyd.
10" x 36" Norton Cylindrical Grinder.
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No. 2 Cincinnati Centerless Grinder.
★ No. 3 Cincinnati Centerless Grinder, m.d.

LATHES, ENGINE
★ 12" x 30" Hendey, Geared Head, new in 1944.
20" x 8' Sidney "Monotrol", g.h.
24" x 30' Lodge & Shipley, g.h.
18" x 8' Monarch, g.h. Timken spindle.
16" x 6' Hendey, g.h.
★ 15" x 30" Lipe Carbo-Matic, new in 1943.

LATHES, TURRET
★ No. 4L Gisholt, 9¼" spindle, chucking.
No. 3B Foster, Timken spindle.
No. 1A, 2A Warner & Swasey.
No. 5 Warner & Swasey Universal, G.H. Timken spindle.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.

MILLS
No. 4A Brown & Sharpe Universal, s.p.d.
No. 3B Milwaukee, plain, m.d.
No. 4 LeBlond Plain, c.d.
No. 2A Brown & Sharpe Universal, c.d.
No. 1 Brown & Sharpe Universal, c.d.
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4" Pratt & Whitney Spline Mill.
42" Bullard Vertical Boring Mill.

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4'-13" Cincinnati-Bickford Radial

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Grinder, Leach 7x11, M.D.
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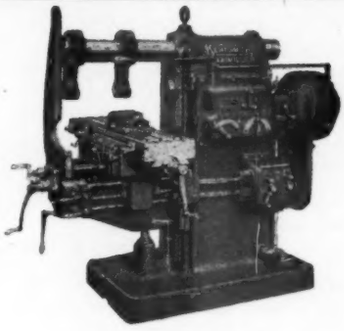
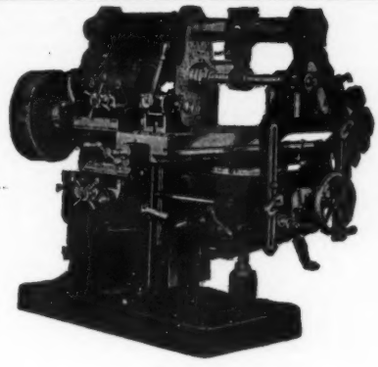


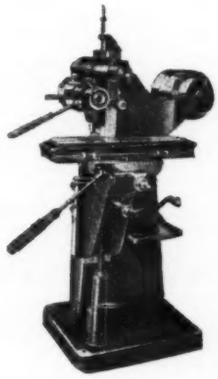
PLAIN

1—No. 2 Ryerson-Conradson Plain Mill table w.s. 13" x 54", with motor
1—No. 2 Cleveland Plain Mill table 13" x 50", with motor
1—No. 2 Milwaukee Plain Mill table 12" x 50", with motor
1—No. 2 Milwaukee Mill table w.s. 11" x 45", univ. hd., with mtr.
1—No. 2 Cincinnati Plain Mill table w.s. 13" x 52", rapid traverse
1—No. 2 Kempsmith Plain Mill table w.s. 10" x 45", with motor
2—No. 2-M Cincinnati Plain Mills table 10" x 49", with motor
1—No. 3-B Brown & Sharpe Plain Mill table 14" x 60", vert. hd., with mtr.
3—No. 3 Milwaukee Plain Mills table w.s. 16" x 60", with motors
1—No. 3 Milwaukee Plain Mill table w.s. 16" x 60", vert. hd., with mtr.
1—No. 3-B Milwaukee Plain Mill table w.s. 16" x 60", with motor
1—No. 3-H Le Blond Plain Mill table 16" x 53"
1—No. 3-B Brown & Sharpe Plain Mill table w.s. 14" x 51", with motor
2—No. 4 Kempsmith Plain Maximills table w.s. 18" x 70", rapid traverse
6—No. 4 Cincinnati Plain Mills table w.s. 19" x 62", with motor
1—No. 4 Cincinnati Plain Mill table w.s. 16" x 58", rapid traverse, vertical head, with motor
1—No. 4-B Milwaukee Plain Mill table w.s. 18" x 76", with motor
1—No. 4-B Milwaukee Plain Mill table w.s. 19" x 76", 2-Sp. vert. hd., with motor
2—No. 5 Cincinnati Plain Mills table w.s. 19" x 68", with motor
1—No. 5 LeBlond Plain Mill table w.s. 20" x 70", with motor
2—No. 5-B Brown & Sharpe Plain Mill table w.s. 21" x 68", with motor



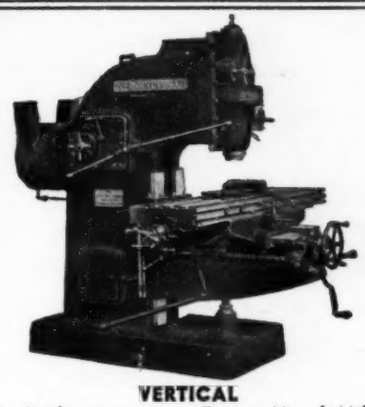
UNIVERSAL

1—No. 1½ Brown & Sharpe Univ. Mill table w.s. 7" x 32", equipped with 4" vise, with motor
1—No. 2 Ohio Univ. Mill table w.s. 9" x 42", 4" vise, with motor
2—No. 2M Cincinnati Univ. Mills table w.s. 10" x 49", equipped with 10" universal dividing head, tailstock and 5" universal vise
1—No. 3A Brown & Sharpe Univ. Mill table w.s. 14" x 60", with motor
1—No. 3-S Cincinnati Univ. Mill table w.s. 12" x 52", with motor
1—No. 4-A Brown & Sharpe Univ. Mill table 17" x 72", with motor
1—No. 5 Cincinnati Univ. Mill table w.s. 20" x 79", power rapid traverse with 12" dividing head and tailstock



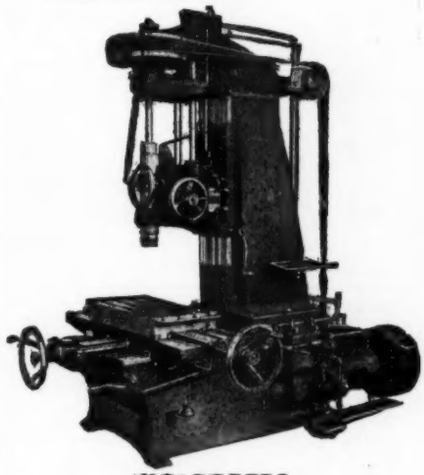
HAND

1—No. 0 Bristol Hand Mill table w.s. 4" x 21"
1—No. 1 Kent Owens Hand Mill table w.s. 5" x 22", chain drive
1—No. 2-RV Kent Owens Hand Mill table 14" x 35" with motor
2—No. 6 Whitney Hand Mills table w.s. 4" x 20", with motor



VERTICAL

1—Bridgeport Vert. Turret Head Mill table w.s. 9" x 32", with motor
2—No. 2 Cincinnati Vert. Mills table w.s. 12" x 47", with motors
4—No. 2½-B Milwaukee Vert. Mills table w.s. 14" x 54", with motors
4—No. 3 Brown & Sharpe Vert. Mills table w.s. 16" x 55", with motors
2—No. 3 Cincinnati Vert. Mills table w.s. 15" x 62", with motors
1—No. 4 Kempsmith Vert. Maximill table w.s. 18" x 76", rapid traverse, with motor
2—No. 5 Becker Vert. Mills table w.s. 13" x 42"
2—No. 6 Becker Vert. Mills table 18" x 61"
1—Model B Becker Vert. Mill table w.s. 12" x 47"



JIG BORERS

1—No. 2 Pratt & Whitney Jig Borer table w.s. 16" x 30", overhang 17", with motor
1—No. 5 Reed-Prentis Jig Borer table 16" x 68"
1—No. 2 Pratt & Whitney Die Sinker overhang 13", table 9" x 13"

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BARDONS & OLIVER #7 Univ.; Timken Bearing; chucking
FOSTER #2F Univ. Fastermatic; Timken Bearing
FOSTER #3F Univ. Fastermatic; Timken Bearing

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LeBLOND 48" x 22' Centers Lathe
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LeBLOND 48" x 40' Centers Lathe
NILES 36" x 25' Centers Lathe
ALL WITH POWER RAPID TRAVERSE, 2 CARRIAGES, TIMKEN BEARING

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BRINELL Automatic Direct Reading Hardness Testing Machine
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HYDRAULIC 16' 8"x4' Flanging Press, R. D. Wood, 450 Ton Capacity, daylight 42", 27½" diameter main cylinder with all equipment. Exceptional price.

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96" CINCINNATI Rapid Production Type, two swivel heads, M.D.
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AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" M.D.
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AUTOMATICS, Cleveland ⅞, 1¼, & 2" Mod. B
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GRINDER, Heald #72 Hydraulic, 2 M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDER, Norton 10"x36" Hydraulic, M.D.
GRINDERS, Landis Hydraulic, 6"x18", M.D.
GRINDERS, Pratt & Whitney 12" Vert. Surface
LATHES, Hendey, E.B.M. type, 14"x7' & 8' M.D.
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LATHES, Morey #3 G. H. Turret, M.D.
LATHES, Lo-Swing 4"x36" Seneca Falls
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Bliss #304	50	17½x18	8"	SS-SA-G-NA.R.
Minsters	93	24 x31	2½"	SS-SA
Bliss #4½	75	26 x21	4-6"	SS-DA & SA-G-RF-CO
Bliss #305	93	24 x24	2½"	SS-SA-G-Shear
Wat. Far #6600	56	45 x 7"	5"	SS-SA-G-NAR-RF-CO
Bliss #306½	150	27 x27	3-6"	SS-SA-G.
Bliss #5-60	150	60 x32	5"	No Adj. Ram-RF-CO
Bliss #7	180	36 x28	1½-4½	SS-DA-G-RF-CO
Bliss #87½	215	28 x28	28"	SS-SA-G-
Bliss #88	255	29 x29	21"	SS-SA-G-
Bliss #89	300 plus	31 x31	20"	SS-SA-G-
Bliss #6	100	29½x24	4½"	SS-SA-DA-RF-CO
Clearing #F-1100	100	36 x36	12-18"	SS-SA-G-
Clearing #F-1200	200	36 x36	12-18"	SS-SA-G-
Clearing #F-1400	400	42 x42	12-18"	SS-SA-G-
Clearing #K-1400	400	36 x36	3-6"	SS-SA-G-K-J.
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Clearing #F-1600	600	48 x48	12-18"	SS-SA
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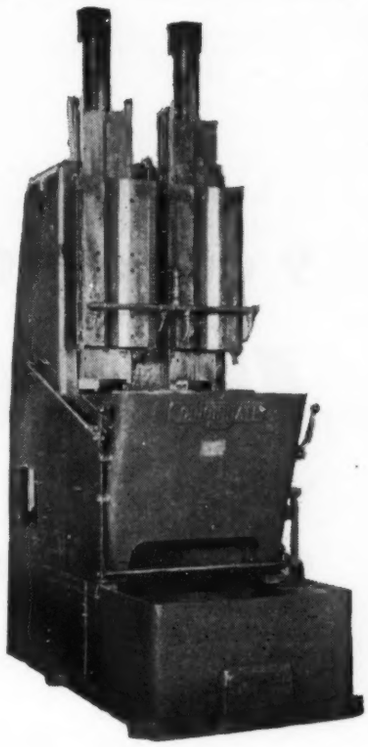

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2—No. 3 La Pointe Double Head Broach.

1—No. 3 American Double Head Broach.

1—XB Twin 10 Oilgear Hydraulic Broach.

1—No. 4 La Pointe Broach.

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1—Type V2-6 American Hydraulic Broach.

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FOR SALE

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1—#2(1") Brown and Sharpe, CD, Collets
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1—#3 Cincinnati Universal, Vert. Attach., CD
7—#2 B & S Universal, 2 Vert. Attach., CD
1—#1 Kempsmith Plain, CD
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1—#3B Milwaukee, Motor Drive

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2—Heald Rotary Grinders, 18" Chuck, CD
1—#3 Landis Univ. Grinder, 12"x36", CD
1—#1 B & S Cyl. Grinder, 10"x24", CD
1—Cincinnati Tool Grinder

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Rochester 4 **New York**

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Address copy to the Classified Advertising Division
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(1) to produce teeth by milling or other process.
(2) to punch for strip ending.
(3) to heat treat low and high tungsten.
(4) to produce Band Saws (Metal).

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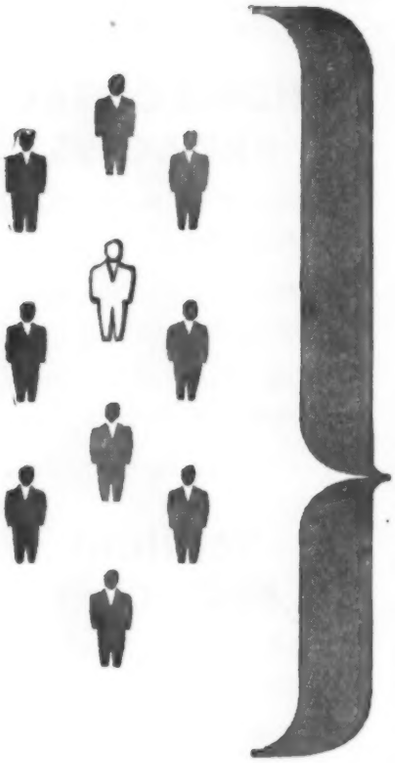

9 OUT OF 10 *want* THE PAYROLL SAVINGS PLAN CONTINUED!

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Every employer can write in his own set of reasons why the Payroll Savings Plan should be continued as a part of his personnel relations program, but the principal advantages are obvious:

A large reservoir of national savings; a strong and stable bulwark against inflation.

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The Treasury Department acknowledges with appreciation the publication of this message by

AMERICAN MACHINIST

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council

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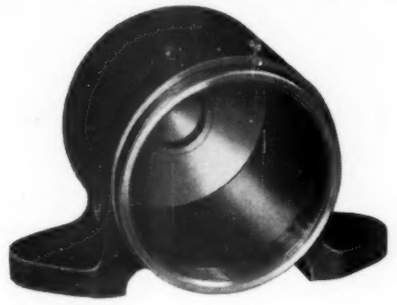
PROVED BY HUNDREDS OF CASE HISTORIES...



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The inside surface of this shock absorber housing must be within a specified tolerance of .002" at all points. This requires not only preservation of accurate diameter but absolute squareness of the end surface with the cylinder.

The remarkable feature of the operation is that Houdaille* turns this part out in 29 seconds, from rough casting to finished piece on a battery of New Britain Model 675 Multiple Spindle Automatic Chucking Machines . . . *with no finish grinding required.* The production of 122 pieces per machine per hour, day-in day-out is an ideal instance of how the speed and accuracy of New Britains combine to give you the utmost in production and low cost per piece.

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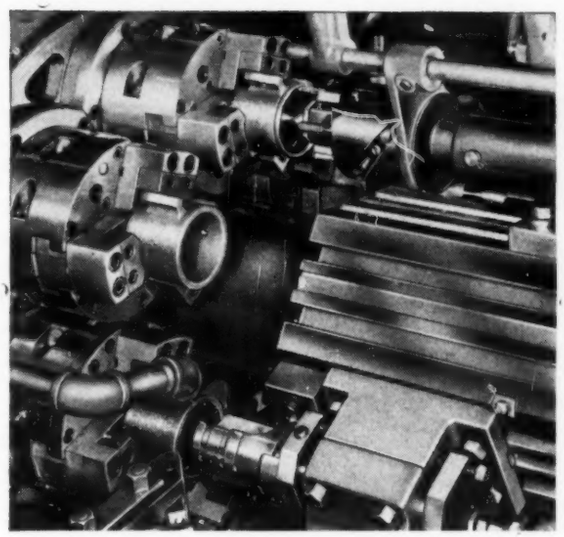
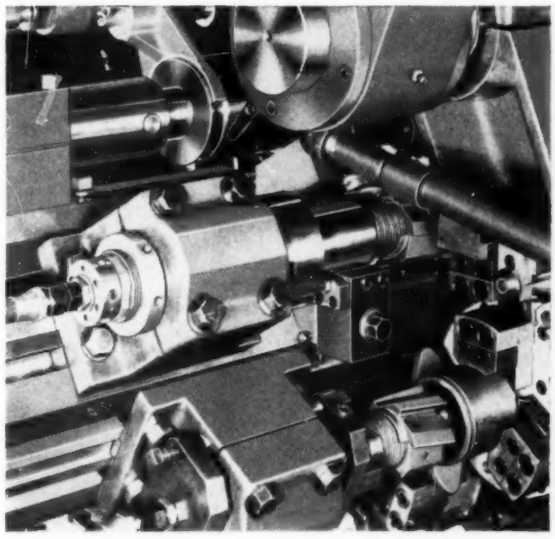
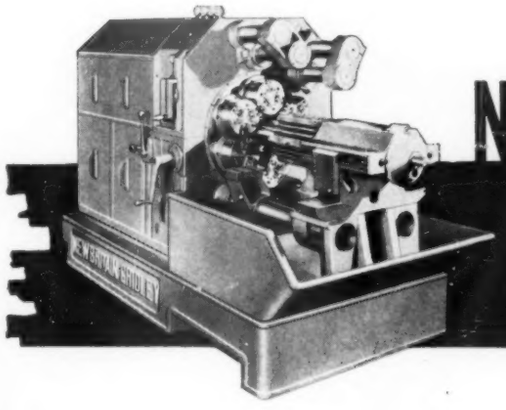
* Pronounced Hoo-dye



FRONT VIEW—Entirely open end construction provides accessibility for simplified chucking, cutting tool and attachment setup.



REAR VIEW—Wide open end construction provides extra large chip space . . . accessibility from three sides and from above that permits excellent visibility and easy tool adjustment.



NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

M-01033

Your Answer Too, May Be Hidden in a Seamless Tube!

Of all opportunities to streamline production operations, none offers more promise than a wider use of Seamless Mechanical Tubing. If the parts you make are round, and have a hole in the center, chances are Timken Seamless Mechanical Tubing of fine alloy steel holds the answer to lower costs.

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The Timken Roller Bearing Company is one of the leading *producers*, and at the same time, the world's largest *user* of seamless mechanical tubes. Its Technical Staff is recognized everywhere as the undisputed authority on the production, selection and machining of tubes.

Our engineers, therefore, are in a position to give you practical answers to your questions and to start you right on operations, involving alloy steel seamless tubing. For interesting data, request our booklet, "Timken Seamless Steel Tubes, Finishes and Sizes." Write Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

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Fine Alloy
STEEL AND SEAMLESS TUBES

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